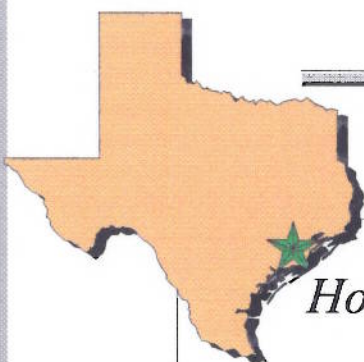




Final Report



*Hoechst Celanese Chemical Group, Ltd.
Bay City, Texas
Closure Report
Injection Well WDW-14 (Well No. 2)*

March 1996

*ECO Solutions, Inc.
9800 Richmond Avenue
Suite 320
Houston, Texas 77042
(713) 780-1955
FAX (713) 780-0870*



ECO Solutions, Inc.

HOECHST CELANESE CHEMICAL GROUP, LTD

Bay City Plant

Final Closure Report for WDW-14 (Well #2)



Prepared by:

*ECO Solutions, Inc.
9800 Richmond, Suite 320
Houston, Texas 77042*

March 1996

Job No. 95043

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PLUG & ABANDON CERTIFICATION



The undersigned has reviewed all pertinent information concerning the plugging and abandonment of Hoechst Celanese Chemical Group, LTD's (HCCG) Waste Disposal Well No. 14 (WDW-14) with regards to the plans and specifications set forth in Texas Natural Resource Conservation Commission (TNRCC), Underground Injection Control (UIC) Program and the current Federal and TNRCC requirements for the plugging and abandonment of a Class I hazardous waste disposal well located in the State of Texas.



In accordance with TNRCC/UIC Program, 31TAC 331.46, closure standards of HCCG's Permit No. HW-50153-000, I certify that WDW-14 was plugged and abandoned in compliance with the permit and applicable TNRCC regulations in effect at the time of plugging and abandonment of WDW-14.

This certification is not valid unless the engineer's original signature and raised seal are present.

DATE

4/12/96

(SEAL)



Wesley W. Smith, P.E.
Texas Professional Engineer
No. 29398

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1.0 INTRODUCTION AND EXECUTIVE SUMMARY

1.1 INTRODUCTION

Hoechst Celanese Chemical Group, Ltd. (HCCG) contracted ECO Solutions, Inc. (ECO) to perform the plugging and abandonment (P&A) of their Class I ~~non~~^{hazardous} injection well, WDW-14 (Well No. 2), located at their Bay City facility. A schematic drawings of WDW-14 prior to and following P&A operations are included as Figure 1 and Figure 2, respectively. The attached report details the data associated with the P&A field work.

The following provides an overview of the key elements of the P&A on WDW-14 (Well No. 2).

- Submitted details of placement of cement plugs with premium cement and cement retainer to satisfy the P&A requirements of the Texas Natural Resource Conservation Commission's (TNRCC), Underground Injection Control (UIC) Program, 31 TAC 331.46.
- Milled a 50' section of the 9-5/8" long string casing string and underreamed formation and cement out to a 15" radial diameter and cemented the confinement system interval.
- Squeeze cemented perforated section of 9-5/8" casing immediately below 13-3/8" surface casing shoe depth.

Placed pertinent P & A data on top welded steel plate at the surface.

- Submitted an executed copy of the Consent To Revocation Of Texas Natural Resource Conservation Commission Permit No. WDW-14 form and a copy of the recorded deed was submitted to the TNRCC under a separate cover.

HCCG or ECO personnel contacted the TNRCC Austin office prior to commencing and during field operations to allow TNRCC personnel to witness cementing events during the P&A field operations. Mr. Jim Boswell with the TNRCC witnessed the placement and tagging of cement plug No. 2.

1.2 EXECUTIVE SUMMARY

HCCG and ECO personnel met with TNRCC personnel in Austin, Texas and presented a revised plugging and abandonment procedure on WDW-14, WDW-32, WDW-49 and

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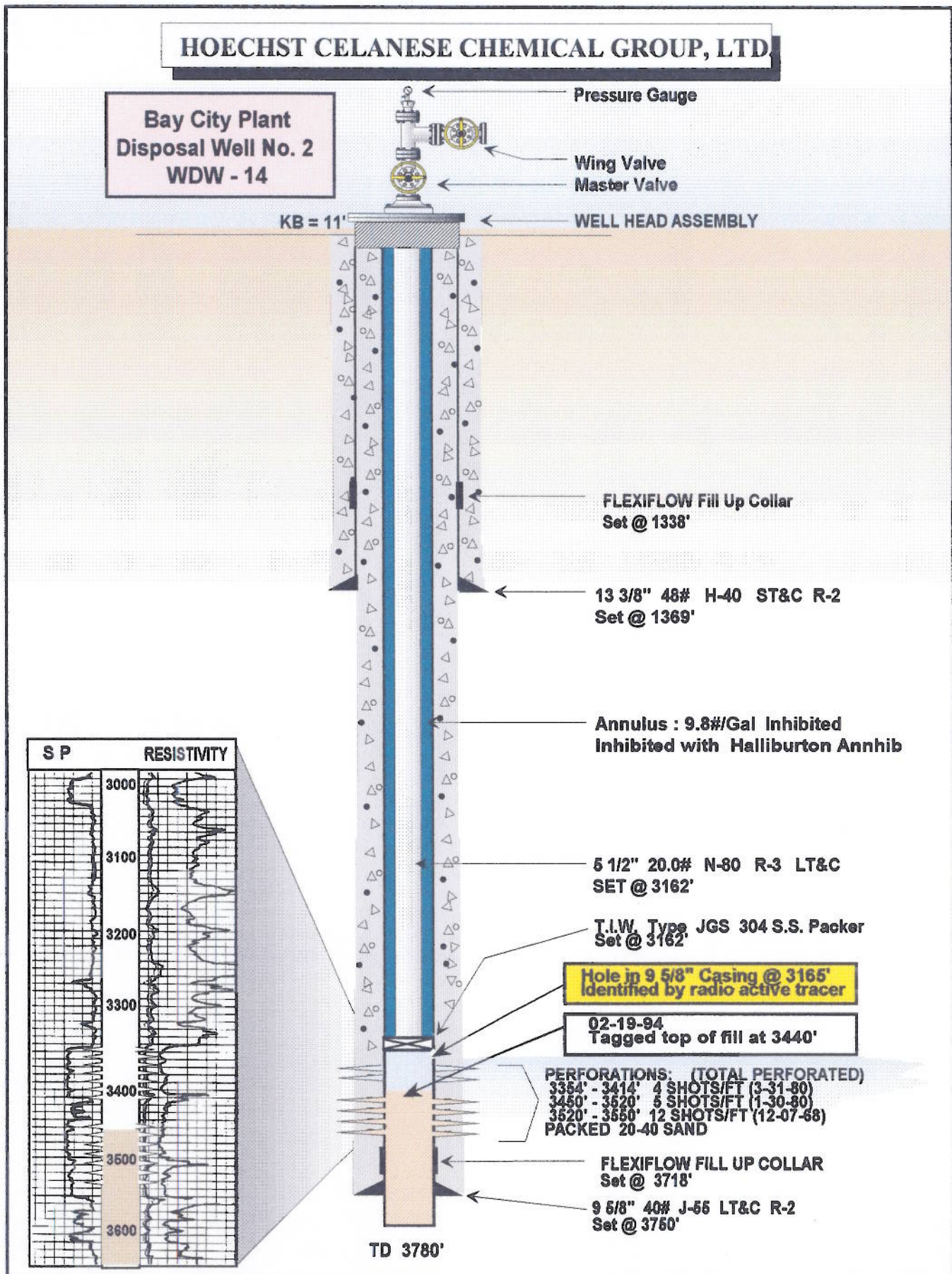
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WDW-110. The new procedure allowed for: (1) milling out a section of the casing string in the confinement interval and underreaming the cement and formation to a radial diameter of +/-15" and (2) perforating the casing string immediately below the 13+3/8" O.D. surface casing shoe depth. On WDW-14, the milled section and underreaming was performed in an interval from 3050' to 3100'. By approval from the TNRCC, this specialized field work substituted for running downhole logs and conducting a final mechanical integrity test.

An extra large workover rig was rigged up on WDW-14 to safely handle the milling and underreaming operations on the 9+5/8" O. D. casing string. A Halliburton wireline set "EZ-SV" cement retainer was set at 3140'. Cement plug No. 1 consisting of 260 sacks of Class "H" neat cement was placed below and above the cement retainer from an estimated depth of 3350' up to 3116'. The 9+5/8" casing was milled from 3050' to 3100' in the confinement interval and then the cement and formation was underreamed from 3050' to 3066' and 3076' to 3100' to a radial diameter of 15". Cement plug No 2 consisting of 280 sacks of Class "H" cement was placed from 3100' to 2420'. Cement plug No. 3 consisting of 390 sacks of Class "H" cement was placed from 2420' to 1500'. The 9+5/8" O.D. long string casing was perforated from 1377' to 1379' with 4 shots per foot. Cement No.4 consisting of 575 sacks of Class "H" cement was placed from 1500' to 10' (below ground level). A 1/2" thick steel plate with pertinent data inscribed on top, was welded to 9+5/8" O.D. casing extending up to grade and surrounded by cement at the surface.

The plugging and abandonment of HCCG's WDW-14 field work was officially completed on March 13, 1996.

FIGURE 1



HOECHST CELANESE CHEMICAL GROUP, LTD.

approx. 2'-0"

approx. 1'-6"

Injection Well #2
WDW-14
TNRCC Permit HW-50153-000
EPA ID No. TX0026040709
Hoechst Celanese

Bay City Plant
Disposal Well No. 2
WDW - 14

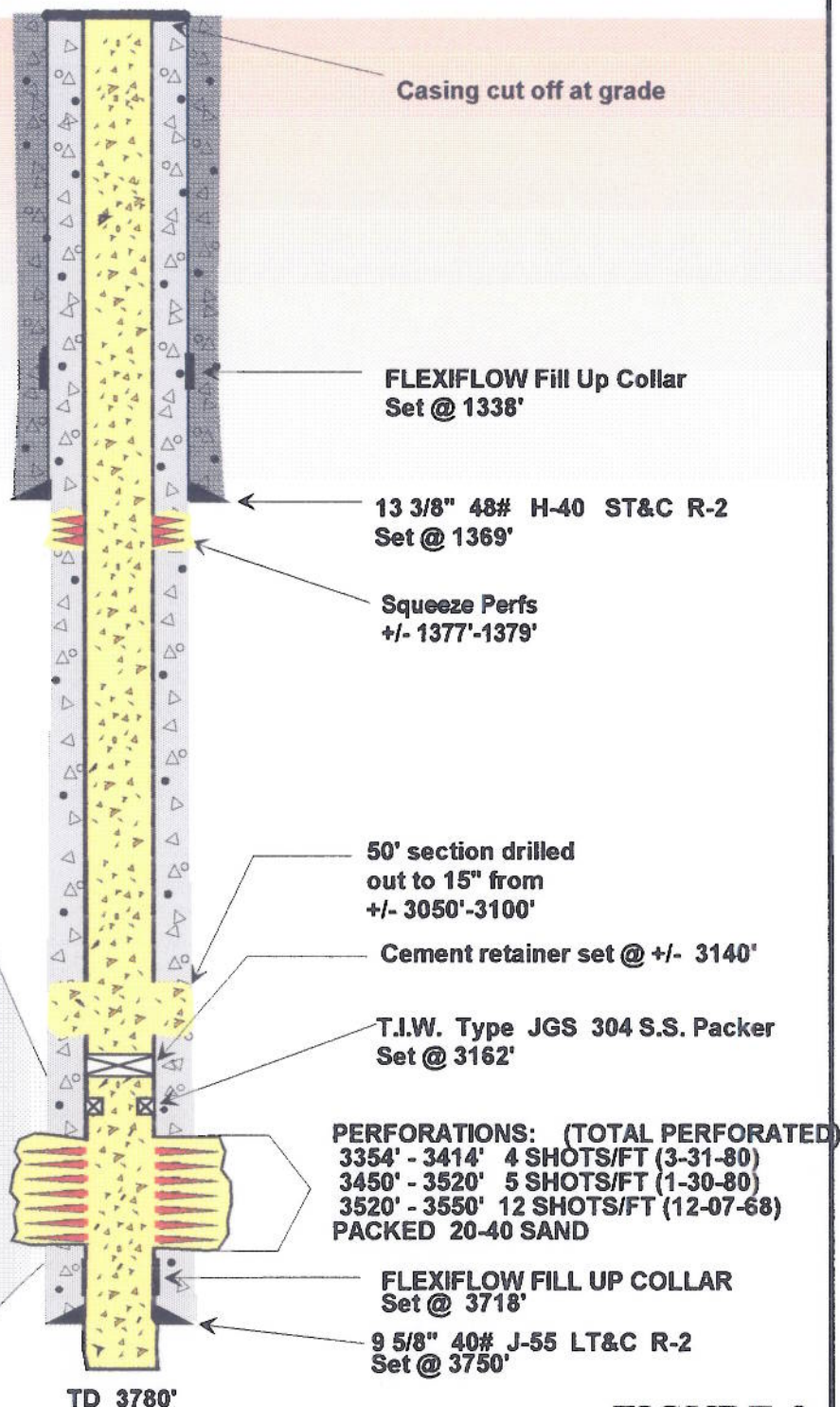


FIGURE 2

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2.0 SUMMARY DAILY REPORTS

Monday, March 4, 1996

(Daylight Operations)

Dawson Well Service began "bobtailing" workover rig #179 and peripheral equipment from Mundy parking lot to WDW-14 wellsite this A.M. (Equipment had been stacked at HCCG's front parking lot over the weekend). Conducted safety orientation for Dawson's rig crews. HCCG personnel laid down "plastic liner" prior to setting substructure, pipe racks, rig carrier, pumps, racks and generator house. HCCG personnel began diking around the South and West sides of the location. Installed four permanent anchors for rig guy lines.

Dawson began rigging up workover rig, #1 and #2 mud pumps, mud mixing system, generator house and peripheral equipment. Spotted substructure. Unable to raise derrick this afternoon due to high winds. Will raise rig tomorrow.

Unscrewed hammer nut on top wellhead to identify the size and type threads for a flange adapter required to install below out preventor (BOP) tomorrow. Closed well in for the night (CWIFT) @9:00 P.M.

NOTE: Dawson power tongs to makeup the 3+1/2" drill pipe are not yet available. Weatherford will provide this service. All depths within this report are referenced to rotary drive bushing (RKB) at 11' above ground level (GL).

Tuesday, March 5, 1996

(Daylight Operations)

Finished moving in Dawson Rig #179 this A.M. Completed rigging up rig, substructure and peripheral equipment - raised derrick. Opened 5+1/2" O.D. valve on injection tubing - well on vacuum. Pumped 240 barrels (bbls) of 9.8 pounds per gallon (ppg) brine down injection string to triple rinse same.

Utilized HCCG "cherry picker" to set mat under the pipe racks and unload Weatherford-Enterra's rental tools including 8 - 6+3/4" O. D. drill collars, 117 joints of 3+1/2" I.F. drill pipe, 11" 3000# Hydril annular BOP, etc. and Weatherford Pipe Services' skid-mounted casing tong units.

HCCG "cold cut" 5+1/2" injection tubing string exposed above wellhead to remove 5+1/2" master valve and welded flange - significant scale present on I.D. of recovered piece. Picked up casing spear, spear packoff plus stop and engaged

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injection string. Picked up injection string - seals free to travel. Removed casing slips suspending injection string. Stripped over threaded flange and Hydril BOP. Nipped up same. Pulled injection string out of packer and laid down first joint. Installed TIW valve on injection string. CWIFN @ 7:00 P.M.

NOTE: Pipe racks settled significantly after drill pipe and collars were unloaded on same.

Wednesday, March 6, 1996

(Daylight Operations)

HCCG "cherry picker" assisted to stabilize pipe racks this A.M. Railroad ties were added to current matting beneath racks to slow settling process. Rigged up Weatherford laydown machine and casing tongs to remove/laydown injection string. (HCCG finished diking location). Pulled out of the hole laying down 5+1/2" 20 pounds per foot (ppf), N-80 injection tubing string and TIW seal assembly. Rigged down 5+1/2" Weatherford casing tongs. Picked up 1 joint of 3+1/2" drill pipe and TIW valve and placed in the BOP. CWIFN @ 5:00 P.M.

NOTE:

- 1) Discussed rack problems (& safety) with HCCG personnel. A decision made to utilize Weatherford's laydown machine to minimize the time required to pickup the 3+1/2" 13.3 ppf drill pipe off the racks and run in the hole.
- 2) HCCG removed the 5+1/2" O.D. 20 ppf injection string from the racks as it was laid down to eliminate pipe rack settling problems. Pipe was taken offsite for waterblasting inside plant.
- 3) Injection string in "fair to good" condition w/heavy scale (approx. 1/4" thick radially) and general corrosion present on string I.D.
- 4) Notified Mr. Jim Boswell of the TNRCC of intent to squeeze cement the injection zone on Friday afternoon. Mr. Boswell asked that we proceed without a TNRCC representative on site. Mr. Boswell requested a Sunday update in order to be on location for the setting of the second cement plug (across the sectioned interval).

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Thursday, March 7, 1996

(Daylight Operations)

Rigged up Weatherford power tongs for 3+1/2" drill pipe this A.M. Picked up 8+3/4" Smith rock bit and 9+5/8" casing scraper and went in hole with same by picking up 3+1/2" drill pipe off the racks w/laydown machine. Tagged the top of the TIW 'S' packer at 3,162' (brine on gravity feed and regulated by casing valve during trip in the hole). Rigged down laydown machine. Pulled out of the hole with drill pipe, bit and casing scraper. Placed 1 joint of drill pipe and a TIW valve in the BOP. CWIFN 6:00 P.M.

NOTE: Sent in underreamer and section mill into Houston to be made up (proper torque) on 1 6+3/4" drill collar (torque-30,000 ft/lbs.). Drill collar joint weight - 3000 lbs. Difficult to safely handle this equipment on the ground. Will have both pieces back on location tomorrow afternoon.

Friday, March 8, 1996

(24-Hour Operations)

Moved in and rigged up Western Atlas this A.M. Went in hole with 7.65" O.D. gauge ring and junk basket to the top of the 'S' packer. Pulled out of the hole with same. Picked up wireline-set Halliburton 'EZ-SV' cement retainer and went in the hole with same. Set 9+5/8" retainer at 3,140'. Pulled out of the hole and rigged down Western Atlas.

Picked up Halliburton "star guide" for cement retainer and went in the hole with same on 3+1/2" drill pipe. Engaged cement retainer at 3,140' w/star guide. Pressure tested cement retainer to 500 pounds per square inch (psi) for 15 minutes - O.K.

Rigged up Halliburton Services to cement squeeze the injection zone. Halliburton pumped in a total of 260 sacks premium neat Class 'H' cement (59 bbls), 15.2 pounds per gallon (ppg) neat cement slurry (Cement plug No. 1). Displaced cement down drill pipe with brine water.

Pulled out of retainer and picked up to 3,100' leaving a total of 5 bbls. of cement slurry above cement retainer. Reverse circulated drill pipe clean (several bbls excess cement in returns). Picked up to 3,070' - reverse circulated brine water out of well. Will wait on cement (WOC) 12 hours prior to tagging cement top.

During WOC time, displaced entire circulating system (surface and subsurface) with a low water-loss mud system from SBM Drilling Fluids. Circulated and

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conditioned mud. After 12-hours, lowered drill pipe back down and tagged the top of cement at 3,116' (soft tag - hard cement top appears to be about 3,105'). Pulled out of the hole with drill pipe and star guide. Set back 3+1/2" drill pipe tongs. Picked up 90K Foster Tongs from Weatherford. Picked up 9+5/8" section mill and 4-6+3/4" drill collars and started in hole.

NOTE: Will continue to utilize power drill pipe tongs - 90K Foster tongs are for make-up/breakout of 6+3/4" drill collars, underreamer and section mill.

Saturday, March 9, 1996

(24-Hour Operations)

Continued in hole with section mill this A.M. Began milling 9+5/8" casing at 3,050'. Continued milling section of 9+5/8" casing down to 3,078'.

Sunday, March 10, 1996

(24-Hour Operations)

Continued milling section of 9+5/8" casing this A.M. Completed the milled portion down to a depth of 3,100'. Milled section extends from 3,050' - 3,100'. Worked section mill cutters back up inside 9+5/8" casing. Pulled out of the hole and laid down section mill.

Picked up 15" underreamer and 4 - 6+3/4" drill collars and went in hole with same on drill pipe down to the top of the milled section at 3,050'. Began underreaming sectioned interval out to 15" diameter - formation (shale) cuttings and cement cuttings in fluid returns at surface. Stopped underreaming at 3,066' due to high rotary torque and "hopping" drill stem. Circulated and conditioned the drilling mud (drilled cement from behind the 9+5/8" casing, flocculated the mud system and treated out same prior to continuing underreaming operations).

NOTE: Called Mr. Jim Boswell with the TNRCC at 3:00 P.M. and left message on his voice mail that the second cement plug (across the milled section) would be set at approximately 4:00 P.M. tomorrow.

Monday, March 11, 1996

(24-Hour Operations - Reverting to Daylight Operations Today)

Decision made to close underreamer and attempt to pass down through obstruction (possible centralizer on outside of 9+5/8" casing string) and then begin

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underreaming again at approximately 3,076' (If obstruction is a centralizer, leave same cemented in borehole wall). Began underreaming again at 3,075' out to 15". Continued underreaming down to a final depth of 3,100'.

Reviewed previous 24-hour milling/underreaming operations and subsequent difficulties with HCCG personnel. ECO recommended and HCCG concurred to leave the centralizer cemented to the borehole wall (shale section) to minimize potential downhole risk. Circulated and conditioned mud for cement contamination. Pulled out of the hole and laid down underreamer.

Picked up 3' long mule shoe and went in the hole with same on drill pipe. Lowered drill pipe and tagged bottom at 3,103' - apparently pushing metal shavings in front of mule shoe.

Rigged up Halliburton to cement sectioned/underreamed interval from 3,100' - 3,050' with Class 'H' cement. Halliburton set balanced cement plug No. 2 with 280 sacks premium Class 'H' cement mixed at 16.2 ppg. Estimated top of cement plug approximately 2,478'. Pulled drill pipe to 2,400' and reversed circulated excess cement out of borehole. Rigged down and released Halliburton. Will WOC 12 hours prior to tagging same tomorrow A.M.

Pulled out of the hole with drill pipe and mule shoe. CWIFN @ P.M. Note: Rig now on daylight operations for the remainder of the project.

NOTE: Mr. Jim Boswell of the TNRCC on location and witnessed the cementing of the sectioned interval. Also, Mr. Boswell plans to be on location to witness the tagging of cement plug No. 2 tomorrow at 9:30 A.M.

Tuesday, March 12, 1996

(Daylight Operations)

Went in hole with mule shoe this A.M. Tagged top of cement plug at 2,420'. Picked up to 2,050'. Cleaned drilling mud out of all surface holding tanks in preparation of displacing the system with fresh water. Displaced 10.3 ppg rental drilling mud out of wellbore into vacuum trucks for transport to Victoria. Lowered drill pipe to 2,420' and reversed circulated the balance of the drilling mud out of the hole. Prepared to set cement plug No. 3.

Rigged up Halliburton to set cement plug No. 3. Set balanced cement plug with 390 sacks premium Class 'H' cement mixed at 16.2 ppg. Estimated top of cement is 1,325'. Pulled out of the hole to 1450' - reversed circulated excess cement out

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of well. Rigged down and released Halliburton. Pulled out of the hole with drill pipe. CWIFN @ 7:00 P.M.

NOTE:

- 1) Mr. Jim Boswell of the TNRCC on location this A.M. to witness tagging of cement plug No. 3.
- 2) Will wait approximately 12-hours prior to tagging cement plug No. 3.
- 3) Rigged down and released Foster 90K tongs this A.M.

Wednesday, March 13, 1996

(Daylight Operations)

Rigged up Western Atlas this A.M. to perforate the 9+5/8" casing to squeeze cement same. Western Atlas went in the hole with 5" casing gun and tagged the top of cement at 1,508' (wireline measurement). Perforated 1377' - 1379', 4 shots per foot, 90 degree phasing. Pulled out of the hole and rigged down Western Atlas.

Picked up 8+3/4" drill bit and ran about one half of the 3+1/2" drill pipe racked in the derrick. Tagged top of cement at 1,500'. Rigged up Weatherford laydown machine. Pulled out of hole laying down 8+3/4" bit and that portion of the 3+1/2" drill pipe run in the hole. Picked up mule shoe and ran the balance of the 3+1/2" drill pipe from the derrick. Tagged top of cement again at 1,500'.

Rigged up Halliburton to set cement plug No. 4. Set balanced cement plug from 1,500' to surface using 575 sacks premium Class 'H' cement mixed at 16.2 ppg. Estimated squeeze pressure at perforations due to full column of 16.2 ppg cement - 515 psig. Pulled out of the hole laying down remaining drill pipe. Note: HCCG personnel on location washing cement out of drill pipe as each joint is laid down and Halliburton filling 9+5/8" casing (drill pipe displacement volume) with 16.2 ppg cement slurry. Will WOC 12-hours prior to confirming final cement top. Rigged down and released Halliburton. Removed BOP and washed cement out of same. CWIFN @ 7:00 P.M.

Note: Will rig down Weatherford tomorrow.

Thursday, March 14, 1996

(Daylight Operations)

Tagged top of cement at 10' below GL this A.M. Rigged down and loaded out Weatherford tong unit and laydown machine. HCCG "cherry picker" and

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personnel assisted the loading out of rental equipment. All rental equipment released.

Lowered derrick and began rigging down Dawson Rig #179 and stacking same outside the HCCG front gate.

Friday, March 15, 1996

Completed removal of Dawson rig equipment this A.M.

NOTE: Telecom to Mr. Jim Boswell of the TNRCC - left voice mail which provided detailed update and advise TNRCC of the successful completion of closure field activities on WDW-14.

Thursday, April 11, 1996

HCCG personnel cut off the 9+5/8" casing at grade and welded a 1/2" thick stainless steel plate on top the casing stub with the following data inscribed on top.

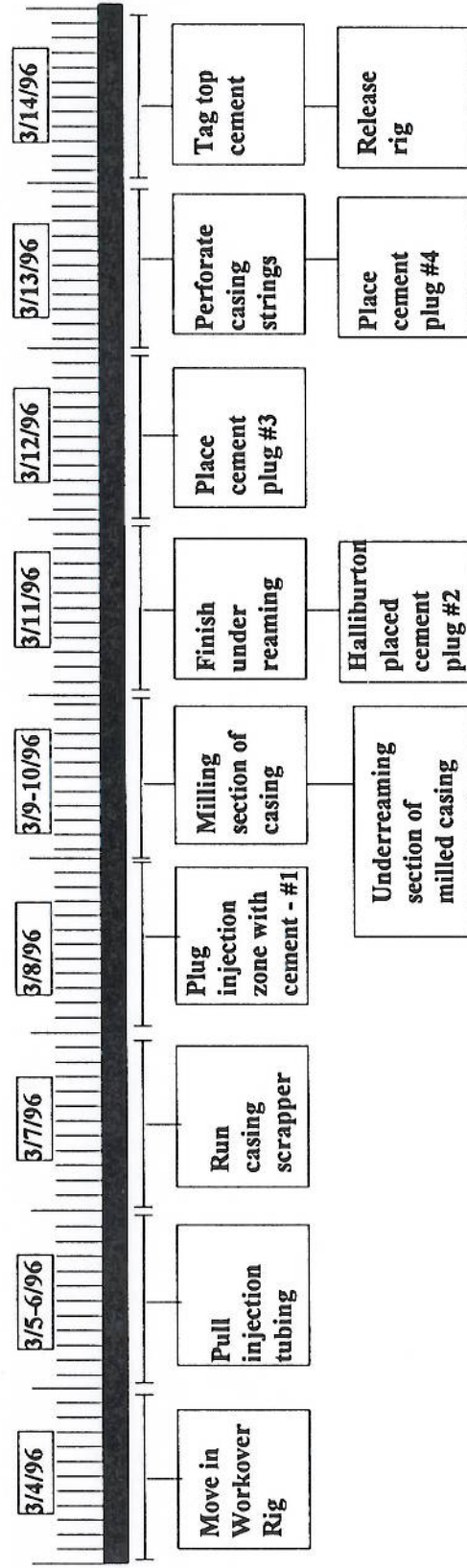
INJECTION WELL #2
WDW-14
TNRCC Permit HW-50153-000
EPA ID No. TX0026040709
Hoechst Celanese

A 6" deep 2'x1+1/2' cement slab was poured at the surface and surrounded the welded surface plate. The surrounded ground was filled in with soil to grade.

FIELD OPERATIONS COMPLETE.

HOECHST CELANESE CHEMICAL GROUP, LTD.

Event Timeline

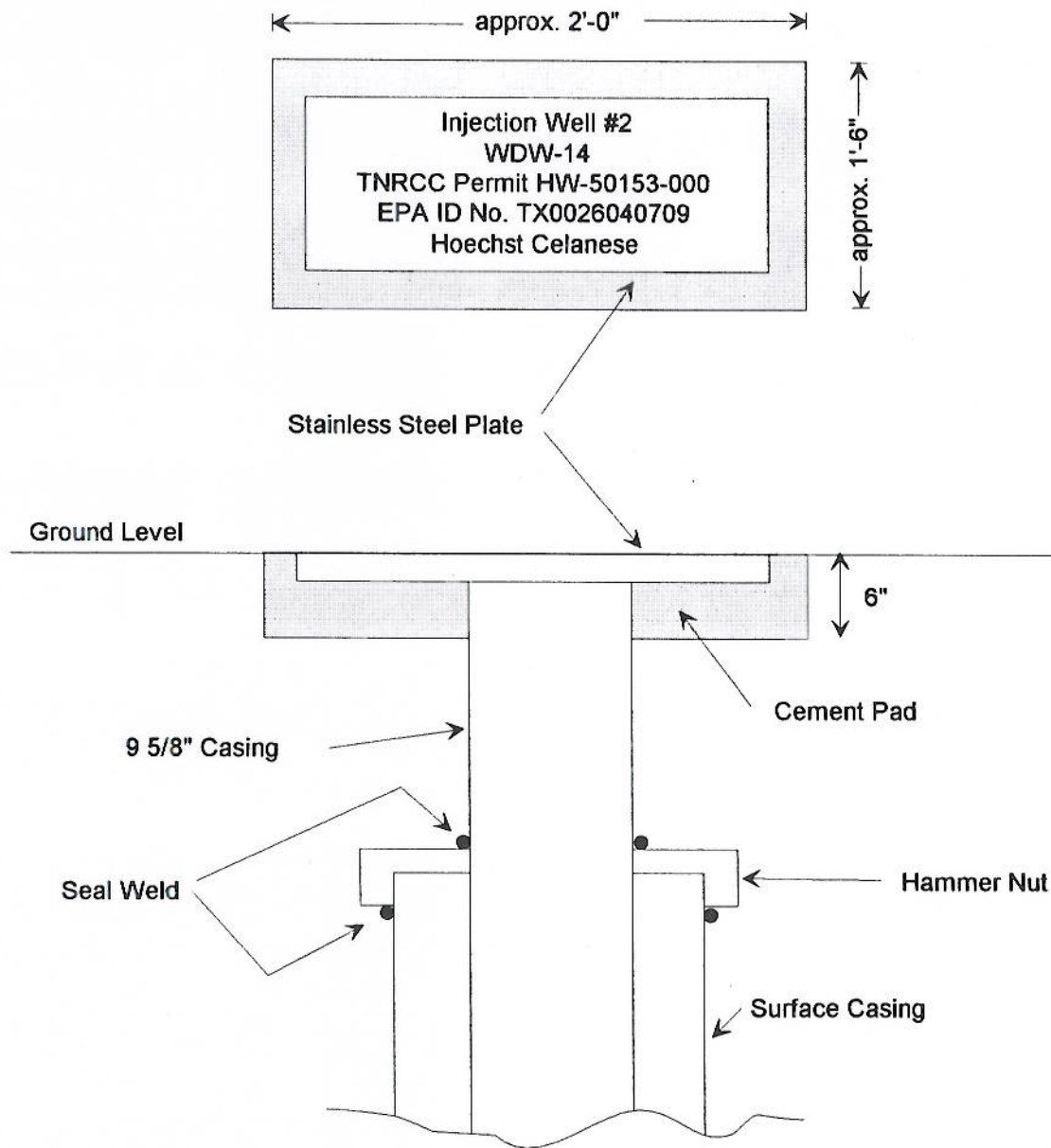


Daily Activities

3/4/96	Move in Workover Rig	3/5-6/96	Pull injection tubing	3/7/96	Run in hole with casing scraper	3/8/96	Plug injection zone with cement - #1	3/9-10/96	Milling and start under-reaming milled casing	3/11/96	Finish under reaming	3/12/96	Place cement plug #3 - WOC	3/13/96	Place cement Plug #4 - WOC	3/14/96	Tag top cement
	Pump in 9.8 ppg brine to triple rinse tubing & kill well										Halliburton placed cement plug #2 - WOC					Released rig	Job complete

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HOECHST CELANESE CHEMICAL GROUP, LTD.
BAY CITY PLANT
INJECTION WELL WDW-14
SURFACE MONUMENT SCHEMATIC



ECO Solutions, Inc.
Hoechst Celanese Chemical
Group, Ltd.
Final Closure Report for WDW-14

APPENDIX A

CONSENT TO REVOCATION OF TEXAS NATURAL RESOURCE CONSERVATION COMMISSION PERMIT

Hoechst Celanese

April 1, 1996
IOC-020-96

Ms. Sarah Vaughn, County Clerk
Matagorda County Courthouse
1700 7th Street
Bay City, Texas 77414

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

Re: DEED RECORDATION OF CLOSURE (PLUG AND ABANDONMENT) OF
CLASS I HAZARDOUS WASTE INJECTION WELL, WDW-14
HOECHST CELANESE CHEMICAL GROUP, LTD.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Ms. Vaughn:

Enclosed are the following documents: (1) Attachment I - A Copy of the Texas Natural Resource Conservation Commission (formally, the Texas Water Commission) Waste Disposal Well Permit, WDW-14. and (2) Attachment II - Required Information Associated with the Closure of WDW-14.

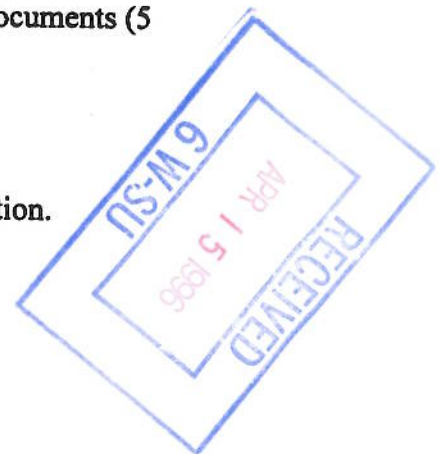
Section IV of the permit is a general description and location of the injection activity. Also enclosed is a check in the amount of \$15.00 to cover the filing fee (\$7.00 for the first page and \$2.00 per page for each additional page) to record these documents (5 pages).

Please deed record these instruments.

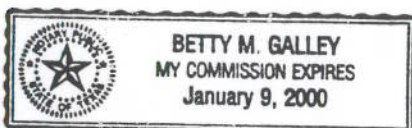
We would appreciate receiving acknowledgment of receipt and recordation.


Very truly yours,


I. O. Coleman, Jr.
Staff Environmental Chemist



Sworn to and subscribed before me by the said I. O. Coleman, Jr. on this 3rd day of April, 1996. My commission expires on the 9th day of January 19 2000.




Notary Public in and for
Matagorda County, Texas

Hoechst 

IOC-020-96
April 1, 1996
Page 2

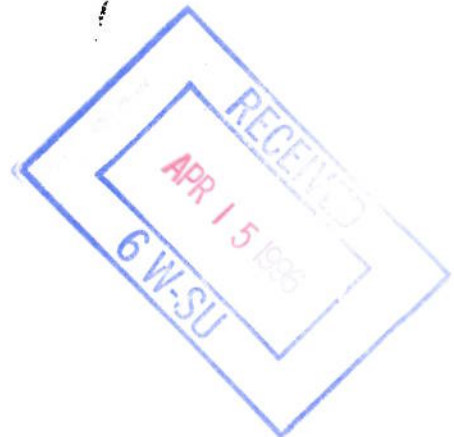
cc: Mr. Ben Knape, Chief
Underground Injection Control Unit (MC-131)
UIC. Uranium & Radioactive Waste Section
Industrial and hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger
Underground Injection Control Program
United States Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2733



IOC-020-96
April 1, 1996
Page 3

bcc: W. E. Dentler -	w/o Attachments
C. J. Griffith -	" "
R. S. O'Neal -	" "
R. E. Van Wie -	" "
P. H. Richardson -	" "
R. J. Johnston -	" "
R. E. Tower -	" "
M. D. Garcia -	" "
L. J. Wenk -	" "
H. R. Horton -	" "
B. S. Barrington -	" "
G. J. McCarthy -	" "
A. Conley- Pitchell - Bridgewater	
Environmental File Nos. 203.21 and 403.2A	



THIS CHECK IS IMPRINTED WITH THE HOECHST
JAPANESE OFFICIAL CHECK SIGNATURE

ATTACHMENT I



TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

Permit No. WDW-14

This permit supersedes and
replaces TWC Permit No.
WDW-14 issued
January 13, 1987

PERMIT to conduct Class I underground
injection under provisions of Chapter
26 & 27, Texas Water Code

I. Name of Permittee:

A. Name Hoechst - Celanese Chemical Group, Inc.
B. Address P. O. Box 509
Bay City, Texas 77404-0509

II. Type of Permit: Regular _____ Amended _____ X
Commercial _____ Non-commercial _____ X
Hazardous _____ X Non-hazardous _____

III. Nature of Business: Petrochemical Plant

IV. General Description and Location of Injection Activity:

The disposal well is used to dispose of industrial waste from the Bay City Plant. The well is located approximately 5,230 feet south and 2,220 feet west of the most northerly northwest corner of the company property, which is located on the James Moore League, Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°52'19" north latitude, 96°01'15" west longitude. The injection zone will be the Upper Miocene Formation in the approximate subsurface depth of 2900 and

CONTINUED on Pages 2 through 5.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit expires at midnight, January 13, 1997, unless renewed or revoked by the Commission.

APPROVED, ISSUED, AND EFFECTIVE this 13th day of May 1991

ATTEST:

Maria A. Vazquez

BYU
For the Commission

RECEIVED

APR 15 1996

6 W-SU

Permit No. WDW-14
Hoechst Celanese Chemical Group
Bay City Plant

Page No. 2

3,700 feet below ground level. The authorized injection interval will be at the approximate subsurface depth of 3,350 to 3,600 feet.

V. Construction History

- A. Permit No. WDW-14 for the drilling and operation of this disposal well was issued on September 28, 1964. The permittee set and cemented surface casing to a depth of 1,369 feet, and long string casing from the surface into the injection zone to 3,750 feet to properly protect each USDW or freshwater aquifer. Cement was circulated outside both casings back to the surface. Any changes to the plans and specifications in the original application were certified in writing by the executive director that said changes provided equivalent or greater protection than the original design criteria and standards.

VI. Character of the Waste Streams

- A. Industrial waste authorized to be injected by this permit shall consist solely of the following waste streams:
1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.
 2. Wastes generated from the manufacture of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. Injection of hazardous wastes shall be limited to the following E.P.A. waste codes: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and Hexavalent Chromium.
 3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams and reservoir.
- B. The specific gravity of injected fluids shall remain a range of from 1.00 to 1.10, inclusive (measured at approximately 68° F).
- C. No discharge of wastes is authorized by this permit from this facility into water in the State other than those waste streams authorized above in Paragraph VI.A. injected into the Miocene Formation within the injection intervals between 3,350 to 3,600 feet.

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ATTACHMENT II

REQUIRED INFORMATION ASSOCIATED WITH THE CLOSURE OF WASTE DISPOSAL WELL, WDW-14

I. LAND HAD BEEN USED TO MANAGE HAZARDOUS WASTE: YES NO

II. NAME OF STATE AGENCY OR LOCAL AUTHORITY WITH WHICH THE
PLAT WAS FILED: Ms. Sarah Vaughn,

County Clerk
County Courthouse
Matagorda County
1700 7th Street
Bay City, Texas 77414

III. NAME OF THE REGIONAL ENVIRONMENTAL PROTECTION AGENCY

OFFICE: United States Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

IV. TYPE AND VOLUME OF WASTE INJECTED, THE INJECTED INTERVAL
AND THE PERIOD OVER WHICH INJECTION OCCURRED:

TYPE OF WASTED INJECTED: Industrial waste water

VOLUME OF WASTE INJECTED: $1,722.6 \times 10^6$ Million Gallons
(Based On An Average Flow Rate
125 Gallons/Minute For 330 Days/
Year For 29 Years Estimate)

INJECTION INTERVAL: Upper Miocene Injection Sand Interval
Between 3,350-3610 Feet (Measured
Depths Based On Well Log)

INJECTION PERIOD: April, 1965- April, 1994



ECO Solutions, Inc.
Hoechst Celanese Chemical
Group, Ltd.
Final Closure Report for WDW-14

APPENDIX B

FINAL MECHANICAL INTEGRITY
TESTING REPORT - WDW-14

ECO Solutions, Inc.

HOECHST CELANESE CHEMICAL GROUP, INC. Bay City Plant

PRESSURE FALLOFF AND MECHANICAL INTEGRITY TESTING FOR WDW-14 (Well #2)

Prepared by:

*ECO Solutions, Inc.
10333 Richmond, Suite 250
Houston, Texas 77042*

March 1994

Job No. 94-004

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APPENDIX J	NOTICE OF FAILURE OF MECHANICAL INTEGRITY TEST
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1.0 INTRODUCTION AND EXECUTIVE SUMMARY

1.1 INTRODUCTION

Hoechst Celanese Chemical Group, Inc. (HCCG) contracted ECO Solutions, Inc. (ECO) to conduct bottom hole pressure falloff and mechanical integrity testing on WDW-14, HCCG's Class I injection well located at the Bay City, Texas facility. The attached report details the data and test results associated with that testing.

The following list provides an overview of the key elements of the testing:

- * A bottom hole pressure (BHP) falloff test was conducted to satisfy the annual mechanical integrity test requirements of the U.S. Environmental Protection Agency (EPA) and the Texas Natural Resource Conservation Commission (TNRCC).
- * An annulus pressure test was conducted to satisfy the annual mechanical integrity test requirements of the EPA and TNRCC.
- * A differential temperature survey was recorded to satisfy that portion of the 5-year mechanical integrity test requirement of the TNRCC.
- * A radioactive tracer survey was conducted to satisfy the annual requirements of the EPA and TNRCC.

The field operations were initiated on Wednesday, February 16th, 1994 and were completed on Tuesday, February 22nd, 1994. Msrs. Reuben Alaniz and Robert Hall of ECO Solutions supervised the testing.

1.2 EXECUTIVE SUMMARY

WDW-14 was indefinitely taken out of service on February 22nd, 1994. The radioactive tracer survey conducted that day indicated a hole in the 9+5/8" protection casing 188' above the top of the permitted injection interval. Larry Walker of the TNRCC was on location while the survey was being conducted. The TNRCC and EPA, Region 6 were notified via

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telecommunications on February 23rd, and via written notification on February 25th (see Appendix J).

It should be noted that, with the exception of the hole in the casing, WDW-14 still has mechanical integrity in a conventional sense and is not an environmental risk. A review of the test and surveys conducted are listed below.

Radioactive Tracer Survey

The analysis of the radioactive tracer (RAT) survey demonstrated that no upward migration from the injection zone is occurring. However, the RAT did indicate a hole in the 9+5/8" protection casing at 3,168'. The hole is beneath the injection packer (see wellbore schematic) yet 188' above the top of the permitted injection interval at 3,350'.

The RAT survey indicated slight downward movement of fluids outside of the 9+5/8" protection casing from 3,168' - 3,212'. It does not appear that a significant amount of fluid has been injected out through the hole. This interpretation is also supported by the temperature survey that was conducted.

The RAT was witnessed by Mr. Larry Walker of the TNRCC and Robert Hall of ECO.

Differential Temperature Survey

The analysis of the differential temperature survey indicated no interformational transfer of fluids occurring behind the cemented protection casing from the top of the permitted interval back to the surface.

The differential temperature survey supports the RAT in regard to fluid movement through the hole. The differential temperature survey does not identify any thermal anomalies in the area of the hole in the protection casing at 3,168' that could be attributed to significant movements of fluid through the hole.

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Annulus Pressure Test

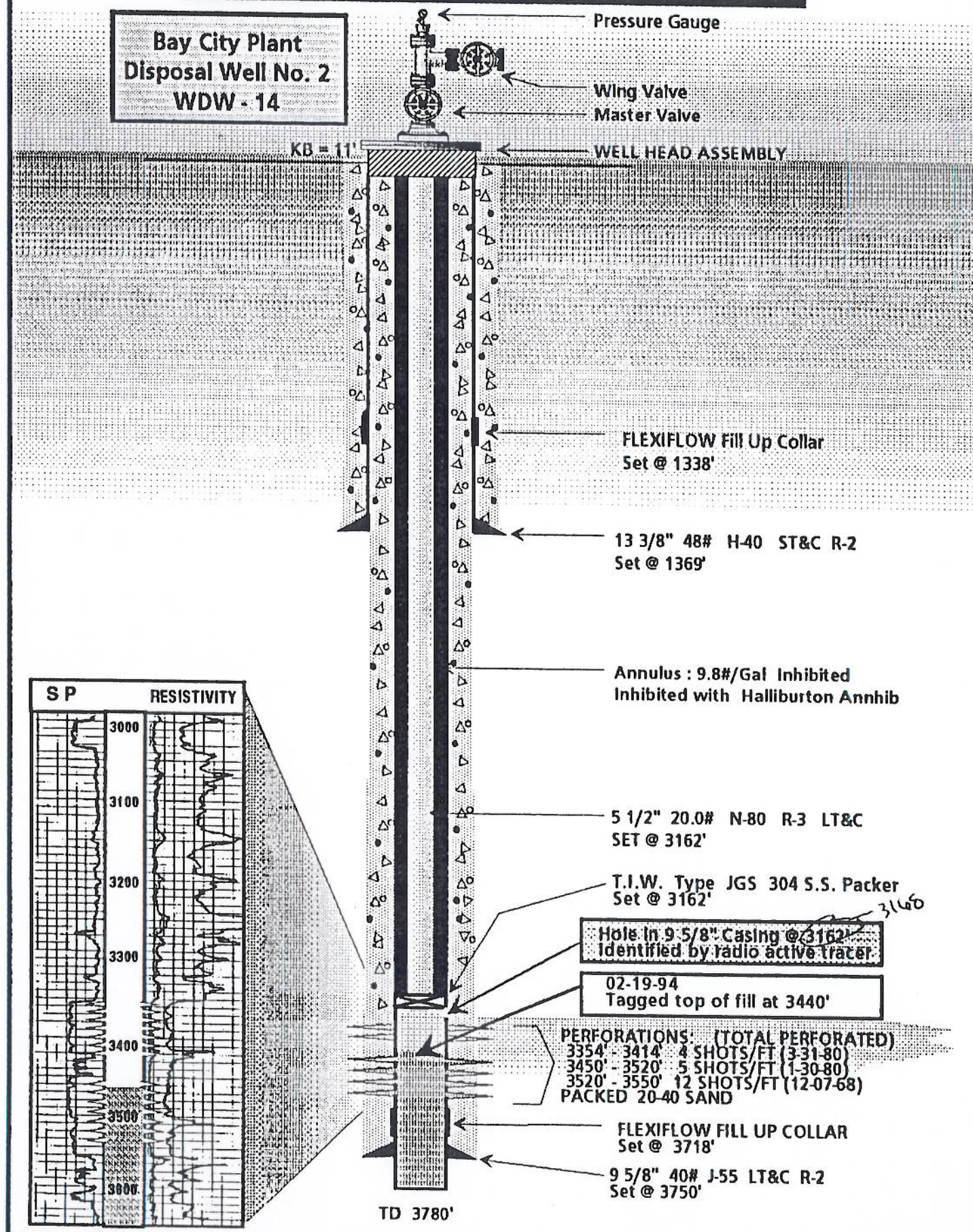
A demonstration of a leak-free annulus was supported by an annulus pressure test (APT). The annulus was pressurized to 892.4 psig on February 21, 1994 for a one (1) hour test. The corresponding shut-in tubing pressure was 75.5 psig at the beginning of the test.

At the end of the test the annulus pressure had decreased to 886.6 psig with a corresponding shut-in tubing pressure of 75.8 psig. The total pressure loss of 5.8 psi is within the 5% pressure loss criteria set by the TNRCC.

FIGURE 1

HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 2
WDW - 14



HOECHST CELANESE CHEMICAL GROUP, INC. - WDW-14 (Well #2)

EVENT TIMELINE

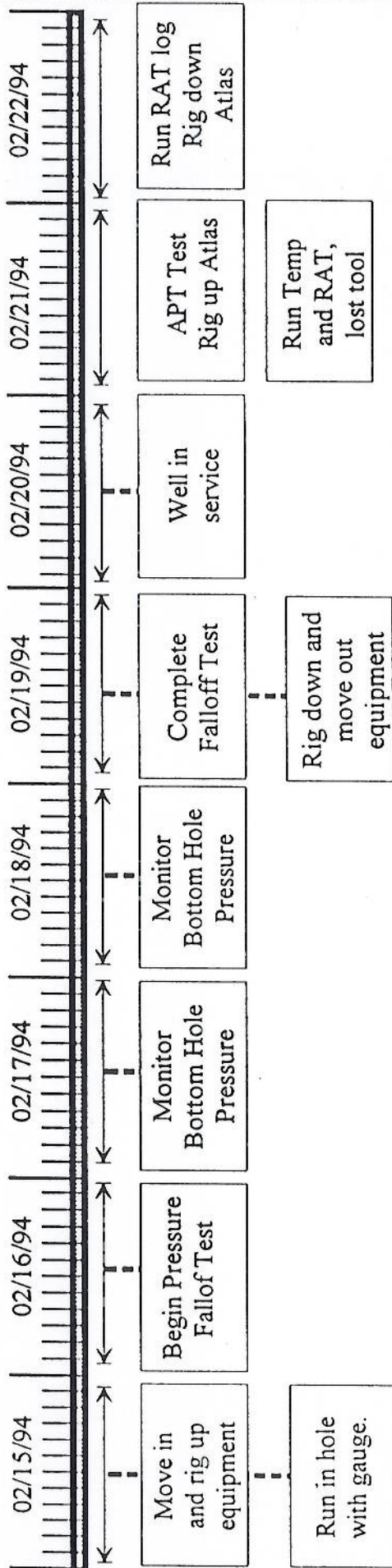


TABLE OF EVENTS

Feb. 15, 1994	Feb. 16, 1994	Feb. 17, 1994	Feb. 18, 1994	Feb. 19, 1994	Feb. 20, 1994	Feb. 21, 1994	Feb. 22, 1994
Move in and rig up equipment.	Begin Pressure Falloff Test.	Monitor Bottom Hole Pressure.	Monitor Bottom Hole Pressure.	Complete Falloff Test.	No field operations.	Perform Annulus pressure test.	Run RAT log.
Run in hole with Panex gauge.				Rig down and move out equipment.		Run Temp. log. Run RAT, lost tool in hole.	Rig down Atlas

FIGURE 2

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2.0 SUMMARY OF FIELD OPERATIONS

Monday, February 14, 1994

A meeting was held with Ray Horton (Maintenance Engineer) to discuss and prepare for the fall-off test scheduled for February 16, 1994. Mr. Reuben Alaniz met with group leaders at the Utilities Department and discussed preparation for fall-off test. The subjects discussed were as follows:

- The shut-down of WDW-32 (Well #3) and WDW-110 (Well #1-A) prior to February 16.
- Shut-in points of Well #3 and Well 1-A, concerning pressure monitoring.
- Blind flange or slip flange injection line going into Well #2.
- Annulus Pressure test on Well #2 following fall-off.

Wednesday, February 16, 1994

Milton Cooke Wireline on location and began spotting equipment.

Reuben Alaniz met with Ray Horton and reviewed the proposed test procedures. Started rigging up on Well #2.

WDW-110 Well #1A out of service	-	Monday, February 16, 1994.
WDW- 14 Well #2 maintain constant rate	-	Monday, February 16, 1994.
WDW- 32 Well #3 out of service	-	Monday, February 16, 1994.
WDW- 49 Well #4 out of service	-	July, 1993.

Begin GRC Data Acquisition System with GRC EPG-520 gauge (S/N 69491).

Pressured up lubricator with Surface Read Out and Memory Gauge back-up tool string. Adjusting wireline counter, prepared to go in hole.

Injection Rate WDW-14 (Well #2)	169 gpm
Surface Injection Pressure	480 psig
Surface Injection Temperature	92 Deg.F

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Going in hole with well injecting.

Injection Rate	169 gpm
Surface Injection Pressure	485 psig

Gauge lowered to test depth of 3,440 feet. Begin monitoring bottom hole injection pressure and temperature. A plant operator blocked valve by mistake and a corresponding pressure decrease was observed. The valve position was immediately corrected.

Monitoring WDW-14 (Well #14) injection period.

Injection Rate	169 gpm
Down hole Injection Pressure	1789 psia @ 3,440'
Surface Injection Pressure	480 psig

Thursday, February 17, 1994

Continue monitoring WDW-14 injection period.

Injection Rate	170 gpm
Down hole Injection Pressure	1788 psia @ 3,440'
Surface Injection Pressure	480 psig

Generate Cartesian curve to evaluate pressure stability.

Continue monitoring injection period.

Injection Rate	170 gpm
Down hole Injection Pressure	1789 psig @ 3,440'
Surface Injection Pressure	480 psig

Generate Cartesian curve to evaluate pressure stability.

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Friday, February 18, 1994

Continue monitoring WDW-14 injection period.

Injection Rate	169 gpm
Down hole Injection Pressure	1791 psia @ 3,440'
Surface Injection Pressure	485 psig

Generate Cartesian curve to evaluate pressure stability. Contact plant personal at Utilities control room to prepare for fall-off test.

Shut down Injection pump at Control room 1 and begin fall-off test.

Final Injection Rate	169 gpm
Final Down hole Injection Pressure	1790 psia @ 3,440'
Surface Injection Pressure	485 psig

Monitor fall-off period.

Down hole Shut-in Pressure	1580 psia @ 3,440'
Surface Shut-in Pressure	0 psig

Continue to monitor fall-off period.

Down hole Shut-in Pressure	1577 psia @ 3,440'
Surface Shut-in Pressure	78 psig

Generate semi-log and log-log curves for observation.

Saturday, February 19, 1994

Continue monitoring WDW-14 fall-off period.

Down hole Shut-in Pressure	1575 psia @ 3,440'
Surface Shut-in Pressure	74 psig

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Generate semi-log and log-log curves for observation. Prepare to end fall-off test.

End of WDW-14 fall-off test.

Down hole Shut-in Pressure	1575 psia @ 3,440'
Surface Shut-in Pressure	74 psig

Move tool downhole to tag bottom. Tagged fill at 3,440 ft. Began pulling out of hole making static gradient stops.

Gauges at surface, end of static gradient survey. Bleed down lubricator and rig down wireline.

Sunday, February 20, 1994

Well in service. No field operations.

Monday, February 21, 1994

All contractors went through the HCCG orientation at Plant Protection and then again down at the well. Larry Walker of the TNRCC on location to witness mechanical integrity testing.

HCCG personnel pressurized the annulus to 892.4 psig on February 21, 1994 for a one (1) hour test. The corresponding shut-in tubing pressure was 75.5 psig at the beginning of the one (1) hour test. At the end of the test the annulus pressure had decreased to 886.6 psig with a corresponding shut-in tubing pressure of 75.8 psig. Pressure test successful.

Atlas Wireline Services was rigged up to run temperature and radioactive tracer survey. Unable to get 1+11/16" logging tools through upper portion of wellhead. HCCG personnel removed same and bored out welded area extending into the inner diameter of wellhead.

Atlas logged differential wellbore temperatures from surface down to the top of fill at 3,443'. Atlas ran the API gamma-ray base log tie in log and two (2) gamma-ray base logs. The logging tools became lodged in the perforated interval and were pulled off the electric line before the Atlas operator could react to the situation (see Appendix K for logging tools left in hole). Pulled out of the hole. Closed well in for night (CWIFN).

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Tuesday, February 22, 1994

Western Atlas picked up additional logging tools this A.M. Atlas conducted the RAT as follows.

1. Ran API gamma-ray tie in strip.
2. Ran #1 base log from 3,348' to 2,776'.
3. Ran #2 base log from 3,348' to 2,776'.
4. Made multiple pass survey #1 with a radioactive slug ejected at 2,900' and a pump rate of 20 gpm.
5. Made multiple pass survey #2 with a radioactive slug ejected at 2,900' and a pump rate of 20 gpm.
6. Ran a stationary survey #1 at 3,342'. Watched slug pass tool and ran check for 15 minutes more. Pump rate was 50 gpm.
7. Ran a stationary survey #2 at 3,342'. Watched slug pass tool and ran check for 15 minutes more. Pump rate at 50 gpm.
8. Ran Gamma Ray base log after survey- repeated passes over "hot" spot at 3,168'.

"Hot" spot, apparent hole in protection casing, downward fluid movement indicated on log.

Pulled out of the hole and rigged down Western Atlas. Discussed same with Mr. Larry Walker of the TNRCC, decision made to close well in. CWIFN.

Wednesday, February 23, 1994

Tom Jones and Robert Hall of ECO met with HCCG personnel to discuss log analysis. Discussed same with Larry Walker of the TNRCC. Made additional notifications to TNRCC and USEPA Region 6 of HCCG's intent to take the well out of service for as yet an undefined time period.

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Rigged down and released Western Atlas.

Thursday, March 3, 1994

Move in and rig up B & G pump truck. Brined in WDW-14, 120 bbls of 9.8 ppg brine inhibited with Halliburton Anhib. Rigged down and released B & G.

3.0 PRESSURE FALLOFF TESTING AND ANALYSIS

3.1 PRESSURE FALLOFF TESTING

Pressure falloff testing commenced on February 16, 1994 and concluded on February 19, 1994. The flowing bottomhole pressure was monitored for a total of 49.38 hours followed by a twenty-four (24) hours shut-in period. The period of last shut-in was October 23 - 26, 1993 and a graphic presentation of injection versus days for this 115 day period is included as Figure 3. Plots and data for the test are included in Appendices A and B, respectively.

3.2 PRESSURE FALLOFF ANALYSIS

Method Of Interpretation: The following analysis was performed by utilizing both Semi-Log and Log-Log analysis. A) The *Semi-Log* curve was generated by plotting pressure vs the superposition time function utilizing the given rate history. The semi-log straight line was then calculated by linear regression through the infinite acting flow period of the falloff curve. The semi-log slope and P_{1hr} values were obtained from the semi-log straight line and utilized for the final permeability and skin calculations. B) The *Log-Log* curves were generated by plotting Delta-P/Delta-Q and Pressure derivative vs the Agarwal Equivalent time function. The Log-Log curves were simultaneously positioned over $[T_D/C_D]$ wellbore storage type-curves until a solution match was obtained. Permeability and skin values were calculated from this match and then compared with those obtained from the Semi-Log analysis.

- A. *Semi-Log (Superposition):* The straight line area of the semi-log curve was identified by first using the 1-1/2 log cycle rule to estimate the end of wellbore storage effects. Secondly, the time of the flat portion from the pressure derivative curve was used in determining the area of the semi-log curve in which the straight line was drawn. The semi-log straight line yielded a slope value of 5.0024 psi/cycle and a P_{1hr} of 1582 psi. The pressure difference between P_{1hr} and the injection pressure followed with the calculated slope would give indications of positive skin damage and high permeability.
- B. *Log-Log ($[T_D/C_D]$ Wellbore storage Type-curves):* The high maximum of the derivative curve illustrates wellbore storage and positive skin effects. The flattening portion of the derivative indicating the infinite acting flow period of the curve was observed

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approximately 1.8 hours following the start time of the falloff period. The flat portion of the derivative curve was the main factor used to obtain a type curve match yielding similar results to the semi-log analysis.

Conclusions: The system was diagnosed as a homogeneous reservoir with a calculated permeability of 1335 (md) and skin damage of +40.6 utilizing an h_{net} value of 210 feet. The flow efficiency of 21.5% suggests that the near wellbore conditions has large affects on the injection volume limitations and that the total pressure drop is primarily due to conditions within a small radius from the well.

The Following Table is provided to give comparative results with the previous test. The primary variables affecting the calculated results are included.

Date MM/YY	Rate GPM	h_{net} feet	Uw cp	Slope psi/cyl	kh/u md-ft	k md	S -
10/92	197	210	0.71	6.2000	177940	601.6	+ 23.7
02/94	169	210	1.49	5.0024	188184	1335.2	+ 40.6

The calculated results indicate a difference in transmissibility, (kh/u) of 5.4% and a difference in skin of 41.6% between the two tests. The increase in skin is most likely caused by the covering of the two bottom set of perforations (3450' - 3520' and 3520' - 3550'). The difference in the permeability values is due to the different viscosity values used in the calculations. The time to exit the waste front exceeded the start time of the infinite acting flow period, therefore the viscosity of the injection fluid was used for the analysis resulting in a much higher permeability value. However the transmissibility values are consistent between the two tests.

A homogeneous simulator was utilized to confirm the calculated results mentioned above. The main assumptions were as follows: a single well with infinite acting and radial flow conditions being injected at a constant rate with constant reservoir conditions such as porosity, permeability, and compressibility. Based on this particular reservoir the simulated data matched the actual data with a reasonable degree of accuracy.

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The program used for final analysis and well simulation was "PanSystem 2.1", marketed by Edinburgh Petroleum Services. Plots of the analysis using the "PanSystem 21" are included as Figures 4 - 8.

Table 3.1
Falloff Test Data - WDW-14 (Well #2)

1.	<u>General Test Information</u>	
	Date of Test	February 16 - 19, 1994
	Time since stabilized pressure (hrs.)	2721
	Cumulative injection (gals.)	2402.35x10 ⁶ gallons
	Wellbore radius (ft.)	0.45
	Gross completed interval (ft.)	160'
	Type of completion	Perforated
	Depth to fill	3,440'
	Justified interval thickness (ft.)	210'
	Average historical waste fluid viscosity (cps)	1.49
	Formation fluid viscosity (cps)	0.71
	Porosity (%)	33
	Total compressibility (psi ⁻¹)	5.0x10 ⁻⁶
	Formation volume factor	1.0
	Initial formation bottomhole pressure (psia)	1501 (1968) @ 3,300'
2.	<u>Injection Period</u>	
	Time of injection period (hrs.)	49.38
	Injection rate (gallons per minute)	169
	Test fluid	Waste Fluid
	Pumps used for test	P61 Byron Jackson - Centrifugal
	Injection fluid viscosity (cps)	1.49
	Final injection pressure (psia)	1790.27
	Final injection temperature (°F)	106.47
	Gauge type	GRC EPG-520 Serial # 69491
	Gauge resolution and calibration	0.01
	Gauge depth (feet)	3,440

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3.	<u>Falloff Period</u>	
	Total Shut-in Time (hrs.)	24.42
	Final Shut-in Pressure (psia)	1574.65
	Final Shut-in Temperature °F	106.79
	Final Shut-in Tubing Pressure (psia)	89

Table 3.2
Results of Analysis of Pressure Falloff Test
WDW-14 (Well #2)

	Semi-Log Superposition	Log-Log Type Curve	Semi-Log Synthesis
kh/ μ (md-ft/cp)	188,184	188,154	188,154
Flow capacity (md-ft)	280,394	280,350	280,350
Permeability (mds)	1335.93	1335.0	1335.0
Skin effect	40.58	41.0	40.6
Dimensionless storage coefficient			Cs = 0.108
p* (psia)	1564.32		

3.3 COMPARISON TO PETITION MODEL DATA

The reservoir properties (pressure, permeability, etc.) of the upper Miocene injection interval were determined through falloff testing conducted on WDW-14. The flowing or operational formation pressures from the tests can be compared with the modeled operational pressures by converting the measured pressures to a depth of 3440' below ground level and removing the pressure increase due to skin effect. The formation pressures predicted by the model assume no formation damage effects or other near-bore conditions. The measured flowing pressures corrected for skin effects and maximum predicted operational pressures are presented in the Table below:

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Formation Pressures WDW-14

Well Name	Flowing Formation Pressures, psi	Skin Pressure Loss, psi	Revised Formation Pressure, psi	Maximum Modeled Pressure, psi
WDW-14 (well 2)	1789	176	1613	1641

The measured flowing pressure is below the maximum modeled operational pressure by more than 28 psi for WDW-14. A graph of the modeled pressures for WDW-14 is included. The graph shows the yearly predicted modeled injection rates (250 gpm for each well). All predicted operational pressures correspond to a depth of 3440' below ground level and an original estimated formation pressure for the upper Miocene injection interval of 1555 psi.

The measured static formation pressures from the well tests, corrected to a depth of 3440' below ground level, show a formation pressure increase of 19 psi. This illustrates that injection operations at the plant have had limited impact on formation pressures and should continue to have limited impact on formation pressures in the future.

Static Formation Pressures From WDW-14 Well Test

Well Name	Static Formation Pressure at 3440'	Formation Pressure Increase, psi
WDW-14 (Well 2)	1574	+ 19

A comparison of the test permeability and transmissivity values with the modeled values of permeability and transmissivity for WDW-14 are given below:

Well Name	Test Permeability, mds	Petition Permeability, mds	Test Transmissivity, md-ft/cp	Petition Transmissivity, mf-ft/cp
WDW-14 (well 2)	1335	1350	188,184	313,700

HOECHST CELANESE CHEMICAL GROUP, INC.
WDW 14 (WELL #2) INJECTION PRESSURE VS. DAYS

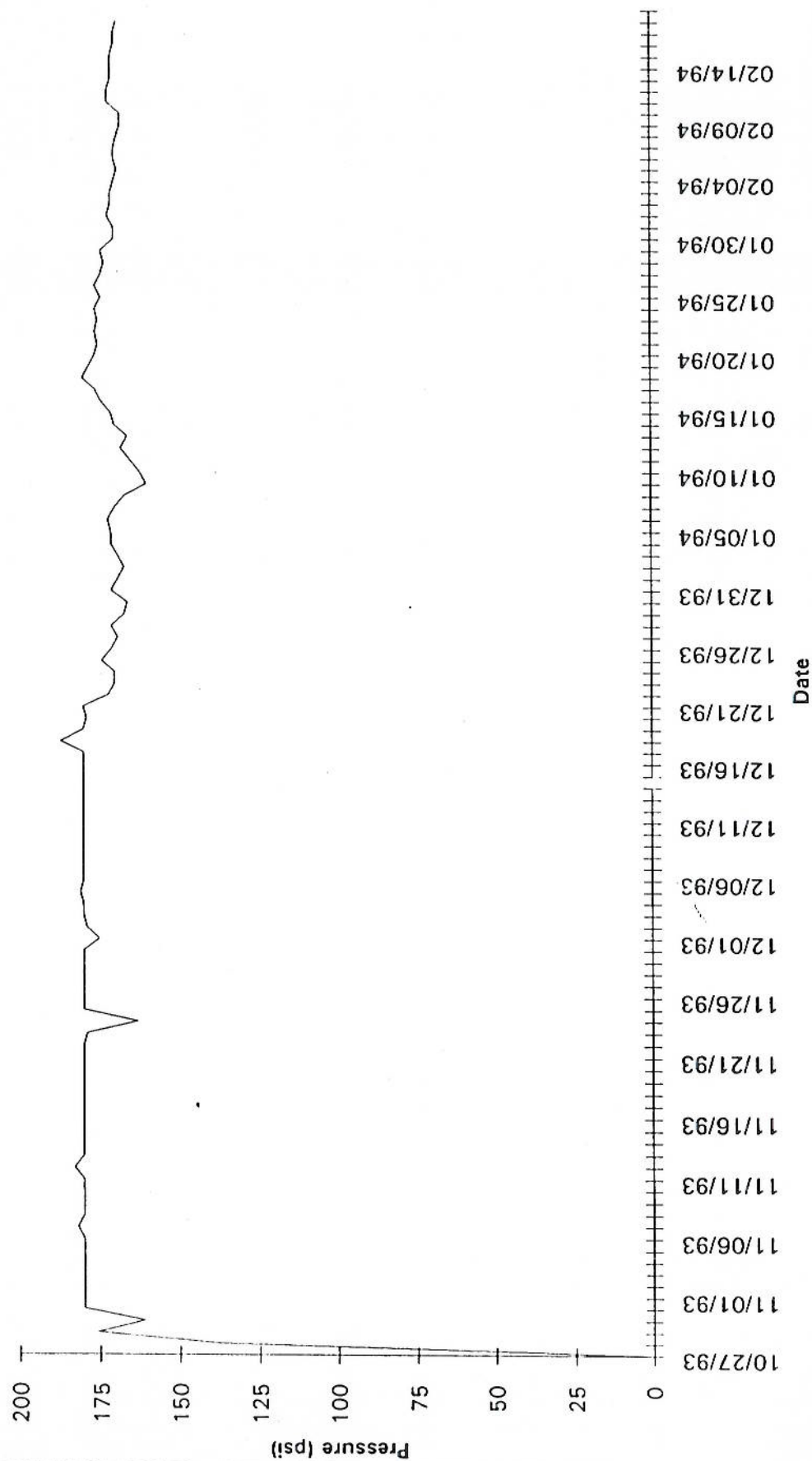
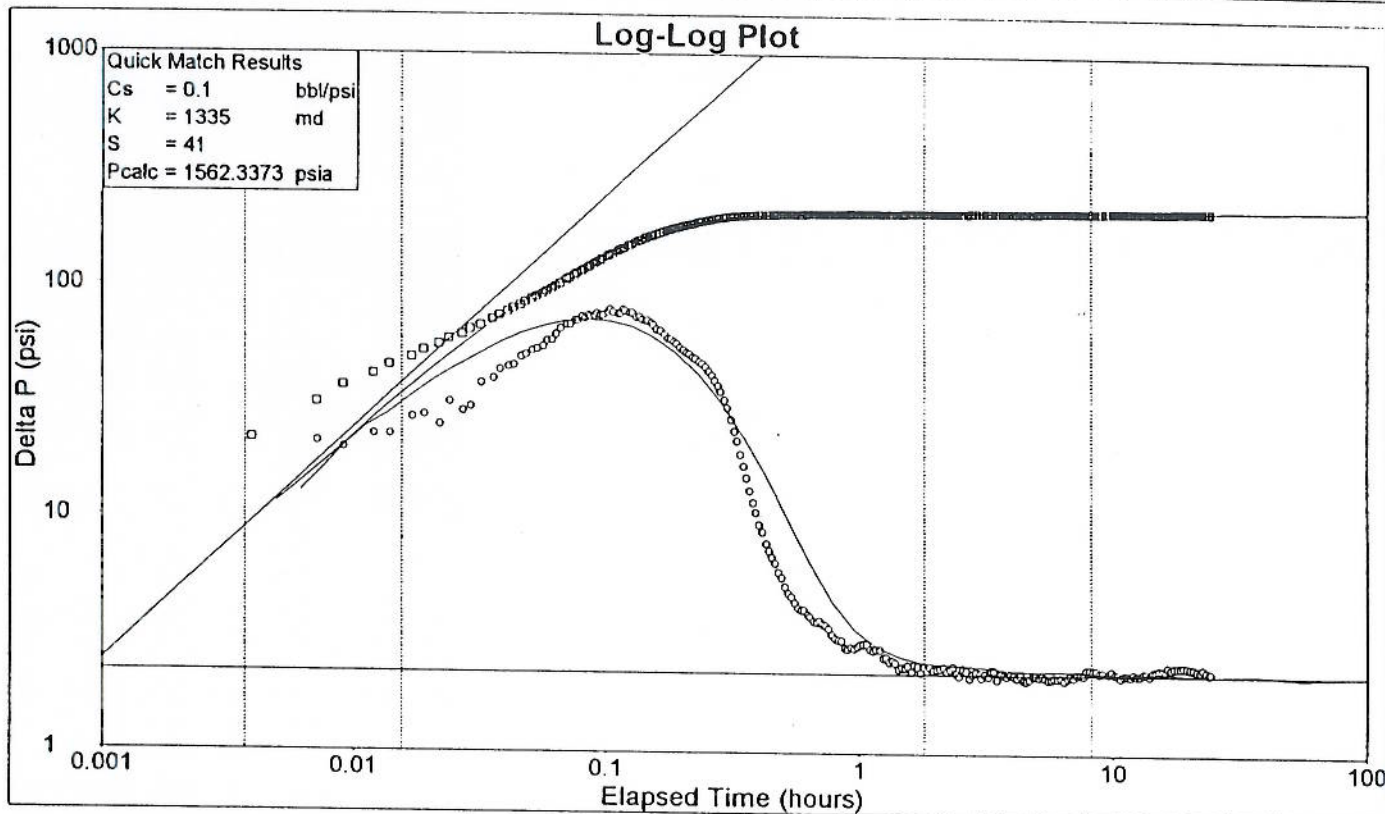


FIGURE 3

ECO Solutions, Inc.
MECHANICAL INTEGRITY TEST
Fall-Off Test Analysis

Report File: WDW14#2.PAN
Analysis Date: 4/04/94



HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

02/16-19/1994

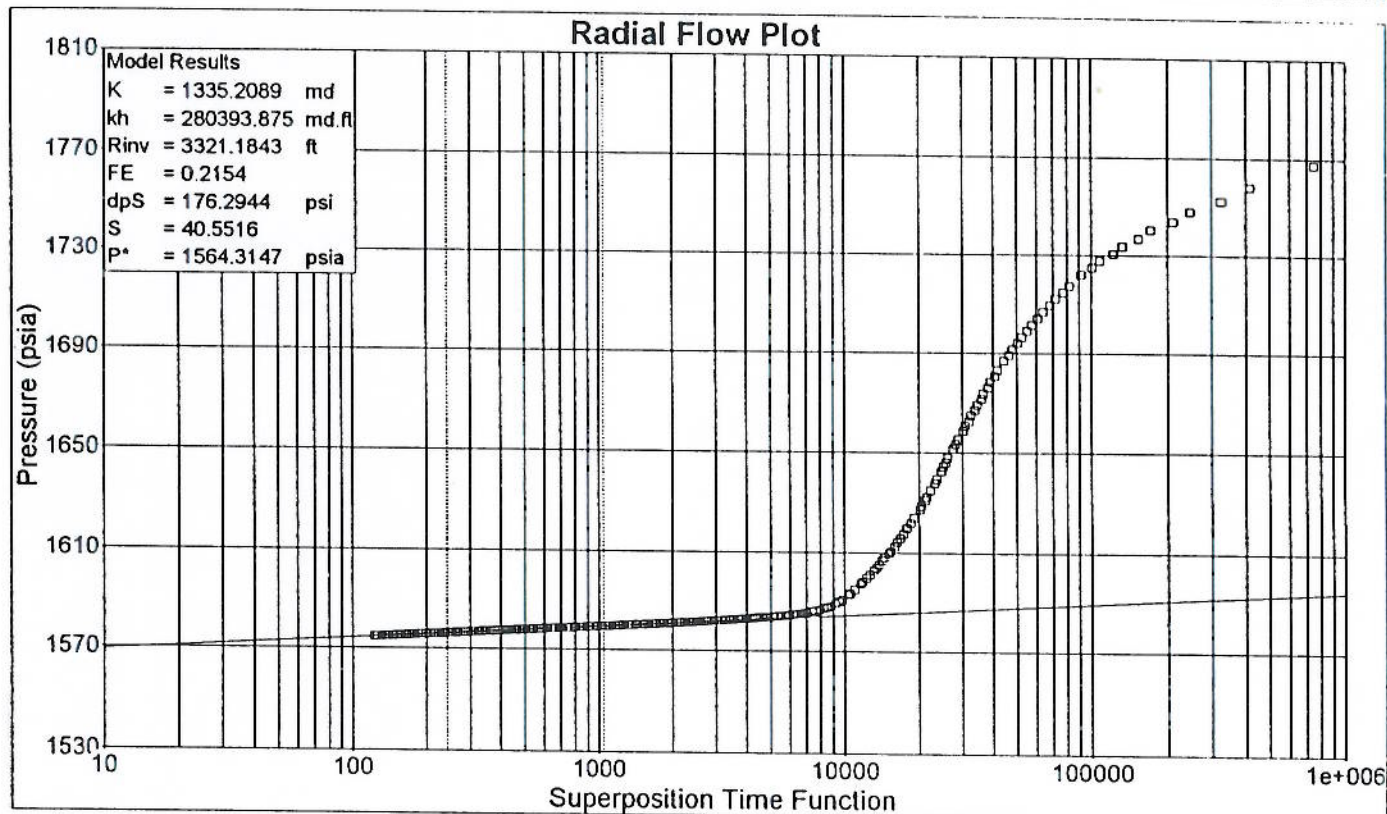
Log-Log plot used to identify flow regimes.

End of unit slope:	Approximately 0.015 hours
Start of infinite acting flow period:	Approximately 1.8 hours
Time to exit waste front:	Approximately 2.6 hours

FIGURE 4

ECO Solutions, Inc.
MECHANICAL INTEGRITY TEST
Fall-Off Test Analysis

Report File: WDW14#2.PAN
Analysis Date: 4/04/94



HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

02/16 - 19/1994

Semi-Log analysis utilizing Superposition Time Function.

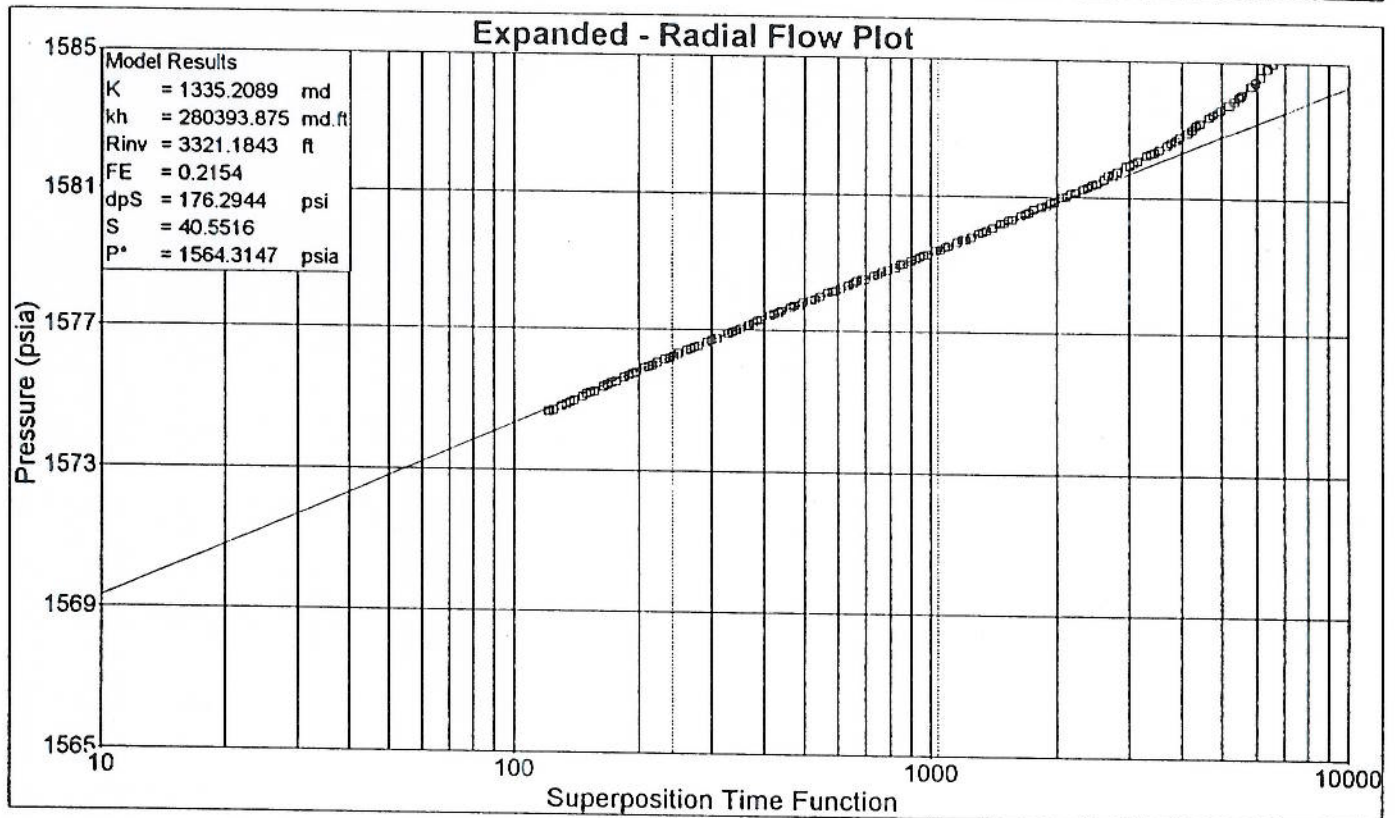
FIGURE 5

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

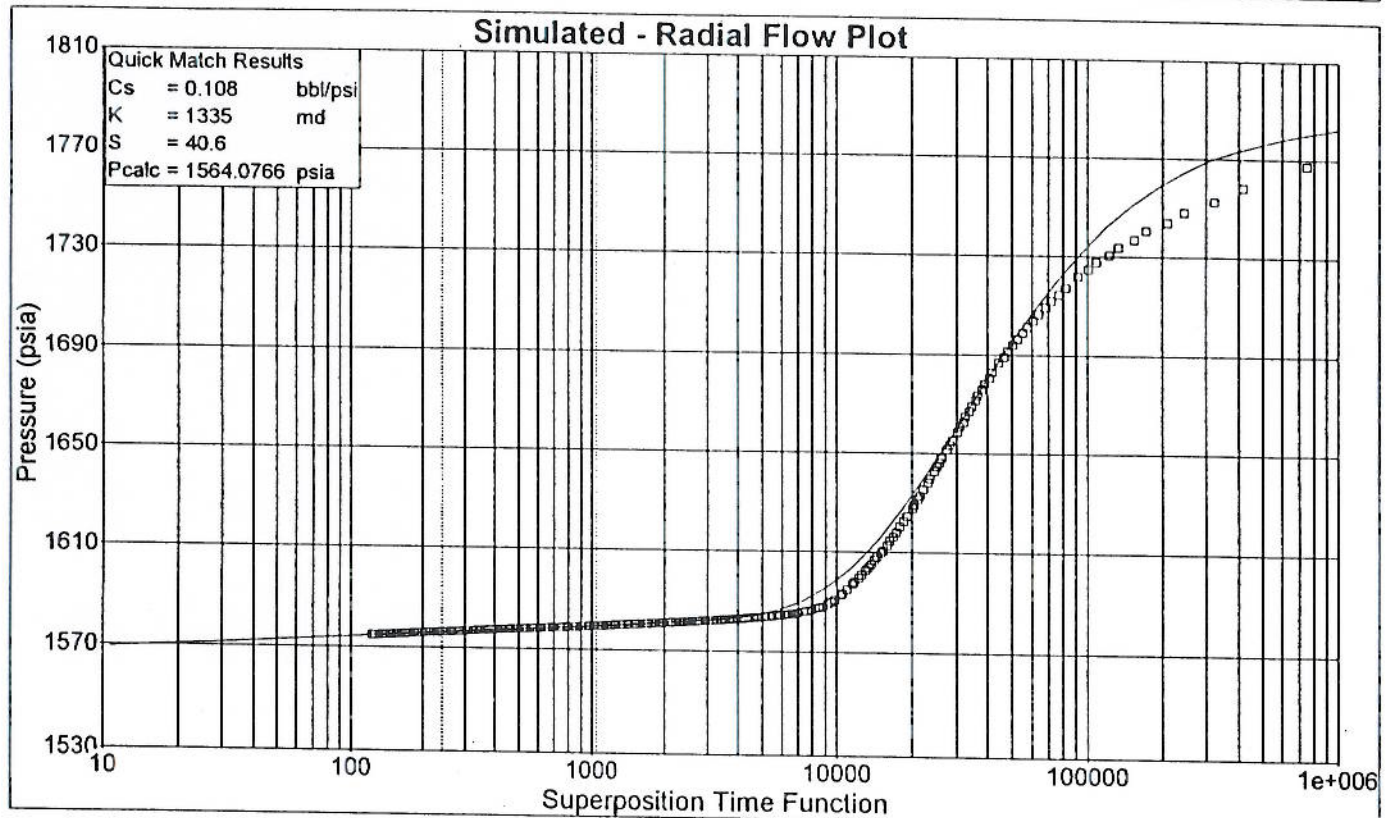
02/16 - 19/1994

Semi-Log analysis utilizing Superposition Time Function.

FIGURE 6

ECO Solutions, Inc.
MECHANICAL INTEGRITY TEST
Fall-Off Test Analysis

Report File: WDW14#2.PAN
Analysis Date: 4/04/94



HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

02/16 - 19/1994

Semi-Log analysis utilizing Superposition Time Function.

FIGURE 7

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Report File:

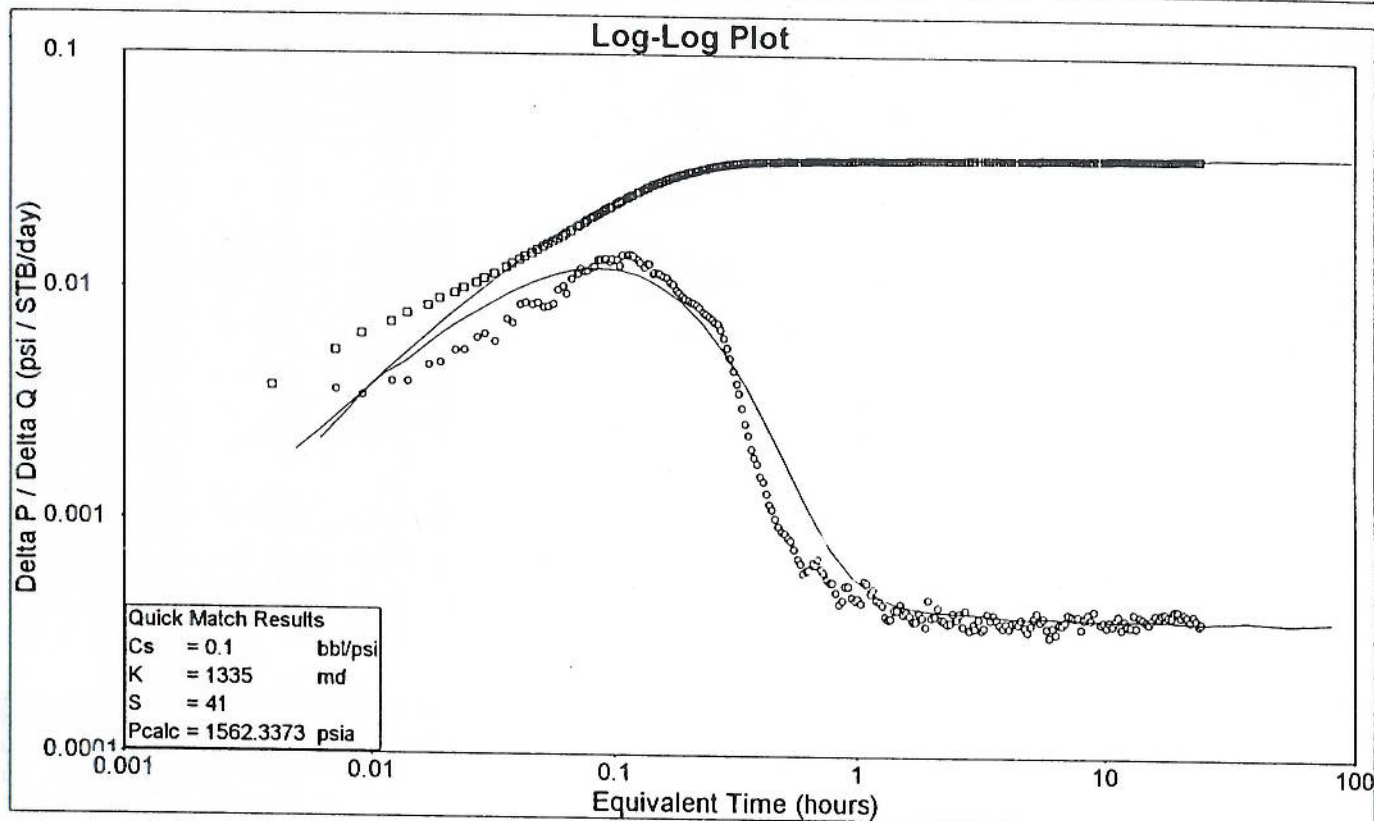
WDW14#2.PAN

MECHANICAL INTEGRITY TEST

Analysis Date:

4/04/94

Fall-Off Test Analysis



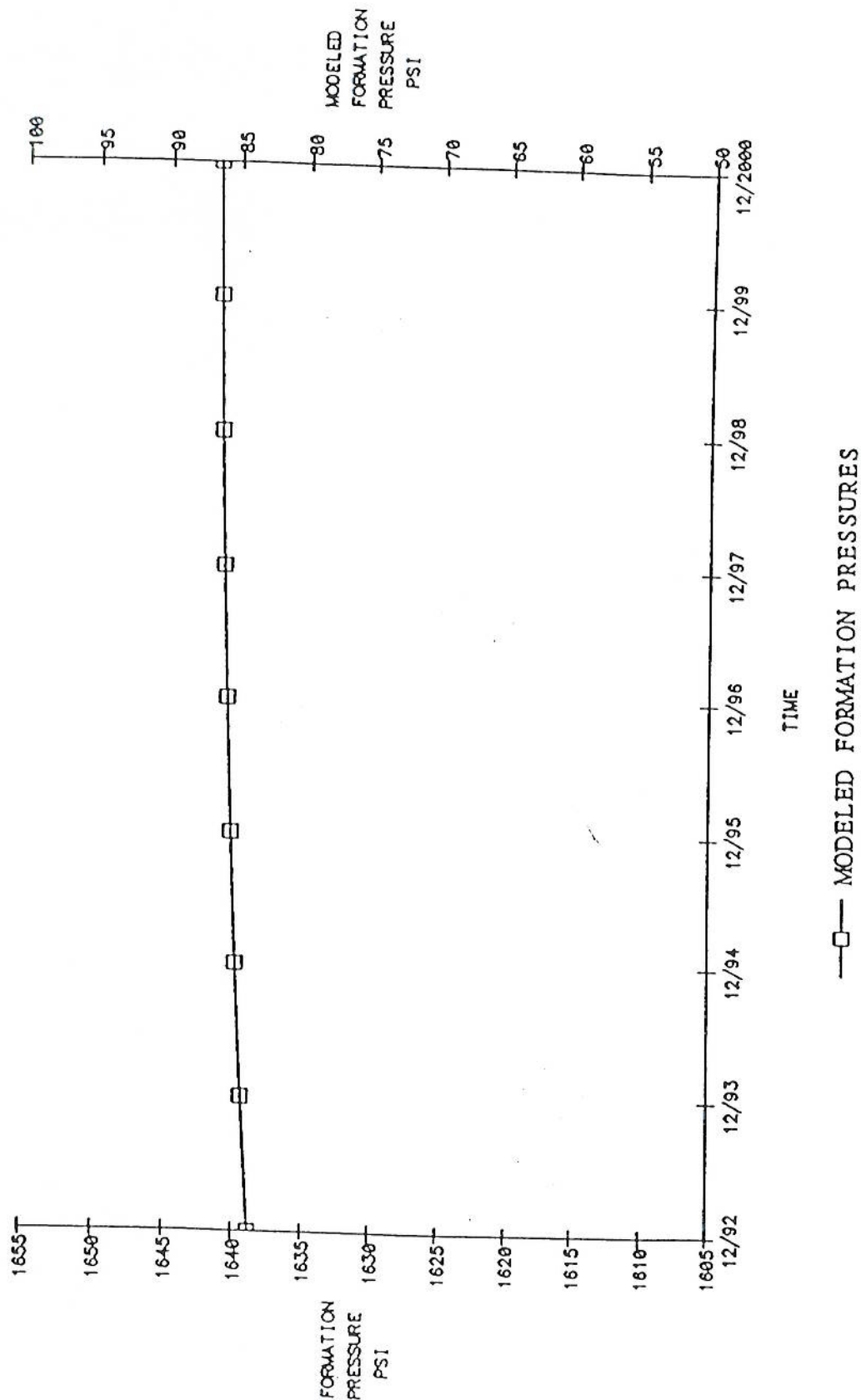
HOECHST CELANESE
CHEMICAL GROUP, INC.
WDW-14 Well #2
Bay City Facility, Texas

02/16-19/1994

Log-Log analysis utilizing Equivalent time function.

FIGURE 8

FIGURE 9
UPPER MIOCENE INJECTION SAND - WDW-14



4.0 EVALUATION OF RADIOACTIVE TRACER SURVEY
INJECTION WELL NO. 2
WDW-14

LOG DATA

Date Run:	February 22, 1994
Logging Service Company	Western Atlas International
Tubing Size and Depth Set	5 1/2" @ 3162'
Casing Size and Depth:	9 5/8" set @ 3650

BASELINE GAMMA-RAY LOG

This baseline gamma-ray log was run from 3348' to 2800'. The purpose of the initial baseline G/R log is to demonstrate repeatability of the logging tools. A comparison of both baseline G/R runs shows good repeatability between the two runs. A gamma ray spike is clearly seen at 3170' which is immediately below the packer. The tracer material was previously ejected from a malfunctioning tool which was subsequently replaced. As is discussed later, the hot spot is determined from additional logging runs to be a casing leak.

BEFORE SURVEY BASELINE GAMMA-RAY LOG 2

A baseline gamma-ray (G/R) was run from 3348' to 2776' to provide a repeat section used in a calibration check. The log is also useful for the following comparisons against additional RAT logging runs.

1. The G/R curves are used as depth control points against other runs during the RAT.
2. The baseline G/R is compared against the final G/R log to check for anomaly areas that could indicate upward migration along a cement channel.

The hot spot beneath the packer at 3170' is again clearly evident.

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CHASE SURVEY 1

The multiple passes or chase survey portion of the RAT provides a check for fluid movement. In this instance, one slug was ejected at a depth of 2900' and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and eleven (11) individual passes (files 17 through 24) were made with two detectors as the slug moved from 2900' to 3046'. Both curves are illustrated on the multiple passes portion of the log. The relatively low flow rate of 20 gpm was necessary to allow sufficient time for the logging tools to be lowered to *make multiple passes and record the progress of the radioactive slug. A flow rate higher than 20 gpm would have caused the slug to move so fast that only a few passes could be made resulting in incomplete coverage of the movement. A summary of the individual passes is given below:*

- a. Pass 1 (file 17) ~~all the slug was ejected at 2900' and logging tool lowered below the~~ tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 2962'. The logging pass is from 2998' up to 2888'.
- b. Pass 2 (file 18) - The slug was recorded inside the tubing with its peak at 3080'. The slug has moved downward 118' since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. This is seen by the shape of the G/R response. The peak intensity is lower than pass 1 and the base of the curve is wider.
- c. Pass 3 (file 19) - The slug was recorded in the 9 5/8" protection casing immediately below the packer which is seen on the casing collar log at 3160'. Twin peaks are observed. The main peak is at 3182' and a smaller one is at 3158'. The main slug has moved downward 102' since pass 2 and 220' since pass 1. The smaller peak observed in the baseline runs appears to have increased in intensity but remained at the same depth. The preliminary indication is a hole in the 9 5/8" casing with no apparent movement. The radioactive slug has spread out slightly by the passes of the logging tool.

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- d. Pass 4 (file 20) - The main slug continues to move downward with its peak at 3214'. The slug has moved downward 32' since pass 3 and 252' since pass 1. In the larger casing diameter, the fluid movement is slower. The secondary peak is unchanged and recorded at 3168'.
- e. Pass 5 (file 21) - The slug was recorded in the 9 5/8" long string casing (below the packer) with its peak at 3248'. The slug has moved downward 34' since pass 4 and 286' since pass 1. The slug shape appears more compacted due to the lower velocity in the larger diameter. No upward migration is indicated on the secondary peak or hot spot at 3168'.
- f. Pass 6 (file 22) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3281'. The slug has moved downward 33' since pass 5 and 319' since pass 1. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- g. Pass 7 (file 23) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3314'. The slug has moved downward 33' since pass 6 and 352' since pass 1. The radioactive slug has spread slightly and its intensity diminished since it is being injected. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- h. Pass 8 (file 24) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3344'. The slug has moved downward 30' since pass 7 and 382' since pass 1. No upward migration is noted. The slug is passing downward past the tool as it is injected. The peak is much smaller in amplitude.
- i. Pass 9 (file 25) - No distinctive peak is observed although the residual of the tracer slug is still observable. A majority of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.

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- j. Pass 10 (file 26) - No distinctive peak is observed although a small residual of the tracer slug is still observable. The log reading is near the original baseline. A majority of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- k. Pass 11 (file 27) - This is a final pass from 3048' up past the packer to a depth of 3082'. A baseline reading is recorded with the exception of the hot spot at 3068'. No movement in the anomaly area is indicated.

CHASE SURVEY 2

The second multiple passes or chase survey portion of the RAT provides a redundant check for fluid movement and verifies the findings from the first chase survey. In this instance, one slug was ejected at a depth of 2900' and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and nine (9) individual passes (files 28 through 36) were made with two detectors as the slug moved from 2900' to 3046'. Both curves are illustrated on the multiple passes portion of the log. The flow rate of 20 gpm is used which is identical to chase survey no. 1. A summary of the individual passes is given below:

- a. Pass 1A (file 28) - The slug was released at 2900' and the tool lowered below the tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 2971'. The logging pass is from 3000' up to 2900'.
- b. Pass 2A (file 29) - The slug was recorded inside the tubing above the packer which is at 3160'. The slug peak is at 3120'. The slug has moved downward 149' since pass 1A. The radioactive slug has spread out which created a loss in amplitude. This shape is normal and is seen by the shape of the G/R response. In other words, the peak intensity is lower than pass 1A and the base of the curve is wider.

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- c. Pass 3A (file 30) - The slug was recorded in the 9 5/8" protection casing below the packer which is seen on the casing collar log at 3160'. As in chase survey 1, twin peaks are observed. The slug peak is at 3211'. The main slug has moved downward 91' since pass 2A and 240' since pass 1A. The smaller peak observed above the main slug body appears to have increased in intensity but remained at the same depth of 3167'. The preliminary indication is a hole in the 9 5/8" casing with no apparent fluid movement. The lower radioactive slug has spread out slightly by the passes of the logging tool.
- d. Pass 4A (file 31) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3261'. The slug has moved downward 104' since pass 3A and 344' since pass 1A. The secondary peak is not observed on this pass since the run was completed at a deeper depth. With the exception of the anomaly at 3167', no additional slug separation is observed.
- e. Pass 5A (file 32) - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3300'. The slug has moved downward 39' since pass 4A and 383' since pass 1A. No upward migration is noted. The slug is passing downward past the tool as it is injected. The peak is much smaller in amplitude.
- f. Pass 6A (file 33) - No sharp peak is observed although the tracer slug is still easily observable. Much of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.
- g. Pass 7A & 8A (files 34 & 35) - No distinctive peak is observed although a small residual of the tracer slug is still observable. The log reading on pass 8A (file 35) is near the original baseline. A majority of the tracer material has been injected and no upward fluid movement from the injection interval is indicated. The secondary peak is not observed on this pass since the run was completed at a deeper depth.

- j. Pass 9A (file 36) - This is a final pass from 3050' up past the packer to a depth of 3116'. A baseline reading is recorded with the exception of the hot spot at 3068'. No movement in the anomaly area is indicated.

FIRST STATIONARY READING ON TIME DRIVE

The stationary survey checks for upward migration under a high flow rate condition. In this case, a radioactive slug was released above 3342' and the recording done on a time drive basis. Fluid was pumped into the well at 50 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3342') for 30 minutes. Since the slug was released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 30 minute period while recording. No second G/R peak was detected and as such no upward migration from the injection interval was detected.

SECOND STATIONARY READING ON TIME DRIVE

This pass is identical to the previous pass but serves as a double check of the equipment and the presence of upward migration. The flow rate and tool position are the same as the previous pass.

A radioactive slug was released at 3342' and the recording done on a time drive basis. Fluid is pumped into the well at 50 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3342') for 30 minutes. Since the slug is released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 30 minute period while recording. No second G/R peak was detected and as such no upward migration from the injection interval was detected.

AFTER SURVEY BASELINE GAMMA-RAY LOG

Immediately after the secondary stationary survey, the logging tool was lowered to 3350'. An after survey baseline G/R log was recorded (file 41). The purpose of this log is to compare it with the before survey baseline G/R log to look for anomaly areas. These areas would appear as "hot spots" or areas in which the G/R readings have been elevated above background levels. A comparison between the before and after baseline G/R logs indicates the following:

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1. The spike indicated at 3168' is residual tracer indicating a hole in the casing at that depth.
2. Two additional peaks not previously observed are indicated below the anomaly at 3168'. One is at 3179' and the other is at 3189'. The interpretation is that fluid movement downward occurred from the casing hole at 3168' in response to the increase in flow rate from 20 gpm to 50 gpm for the stationary surveys.

SECOND AFTER SURVEY BASELINE GAMMA-RAY LOG

A second baseline survey (file 42) was run to further record the downward movement observed from the anomaly area at 3168'. A comparison between the first and second after baseline G/R logs indicates the following:

1. The spike indicated at 3168' allowing fluid to exit the casing and move downward.
2. The two additional peaks not previously observed appear to be moving downward although the initial anomaly at 3168' has not moved.

MULTIPLE AFTER SURVEY BASELINE GAMMA-RAY LOG PASSES

Six additional baseline survey (files 43-48) were run to further record the downward movement observed from the anomaly area at 3168'. The overall result was to :

1. They supported the previous logging passes that there is a hole in the 9 5/8" casing at 3168' allowing fluid to exit the casing.
2. Fluid movement downward from 3168' is occurring.

4.1 RADIOACTIVE TRACER SURVEY CONCLUSIONS

1. A hole in the 9 5/8" casing is indicated at 3168' which is located immediately below the packer.

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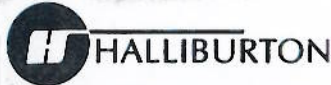
Environmental Consulting and Technical Services

2. A small volume of fluid is exiting the casing at 3168' with the majority being injected through the perforations.
3. Fluid movement is indicated in a downward direction from 3168', however it does not extend to the top of the injection interval.
4. No upward fluid movement is observed from the casing leak at 3168' nor from the injection interval.
5. Fluid movement into the casing hole at 3168' was not observed at the lower flow rate of 20 gpm. Only when the flow rate was increased to 50 gpm was downward fluid movement initiated.
6. Since no anomaly in the area surrounding 3168' was observed on the temperature log, it is concluded that significant volumes of fluid have not entered the casing hole.

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Hoechst Celanese Chemical
Group, Ltd.
Final Closure Report for WDW-14

APPENDIX C

HALLIBURTON CEMENTING AND
WESTERN ATLAS WIRELINE
FIELD TICKETS



JOB SUMMARY

HALLIBURTON
DIVISIONHALLIBURTON
LOCATION

SOUTH TX

FEECNO

BILLED ON
TICKET NO.

883798

WELL DATA

FIELD Bay City SEC. _____ TWP. _____ RNG. _____ COUNTY MATAGORDA STATE TX

FORMATION NAME _____ TYPE _____

FORMATION THICKNESS _____ FROM _____ TO _____

INITIAL PROD: OIL _____ BPD. WATER _____ BPD. GAS _____ MCFD

PRESENT PROD: OIL _____ BPD. WATER _____ BPD. GAS _____ MCFD

COMPLETION DATE _____ MUD TYPE _____ MUD WT. 9.77ppm

PACKER TYPE _____ SET AT _____

BOTTOM HOLE TEMP. _____ PRESSURE _____

MISC. DATA _____ TOTAL DEPTH _____

JOB DATA

CALLER OUT	ON LOCATION	JOB STARTED	JOB COMPLETED
DATE <u>7-8-96</u>	DATE <u>7-8-96</u>	DATE <u>7-8-96</u>	DATE <u>7-8-96</u>
TIME <u>10:00</u>	TIME <u>13:00</u>	TIME <u>13:00</u>	TIME <u>17:00</u>

PERSONNEL AND SERVICE UNITS

NAME	UNIT NO. & TYPE	LOCATION
<u>M. Supak 76671</u>	<u>46057</u>	<u>15530</u>
<u>R. McQuinn 112420</u>	<u>40471 AIR</u>	
<u>P. Wycuff 76677</u>	<u>4434</u>	<u>Book</u>

DEPARTMENT CHIT

DESCRIPTION OF JOB _____

JOB DONE THRU: TUBING ☒ CASING ☐ ANNULUS ☐ TBG./ANN. ☐CUSTOMER REPRESENTATIVE XHALLIBURTON OPERATOR Mike Supak

COPIES REQUESTED _____

CEMENT DATA

STAGE	NUMBER OF SACKS	CEMENT	BRAND	BULK SACKED	ADDITIVES	YIELD CU.FT./SK.	MIXED LBS./GAL.
	<u>760</u>	<u>Proven</u>		<u>TD</u>	<u>WEAT</u>	<u>1.09</u>	<u>16.2</u>

PRESSURES IN PSI

SUMMARY

VOLUMES

CIRCULATING _____ DISPLACEMENT _____ PRESURUSH: BBL.-GAL. _____ TYPE _____

BREAKDOWN _____ MAXIMUM _____ LOAD & BKDN: BBL.-GAL. _____ PAD: BBL.-GAL. _____

AVERAGE _____ FRACTURE GRADIENT _____ TREATMENT: BBL.-GAL. _____ DISPL: BBL.-GAL. _____

SHUT-IN: INSTANT _____ 5-MIN _____ 15-MIN _____ CEMENT SLURRY: BBL.-GAL. _____

HYDRAULIC HORSEPOWER _____ TOTAL VOLUME: BBL.-GAL. _____

ORDERED _____ AVAILABLE _____ USED _____ REMARKS _____

AVERAGE RATES IN BPM _____

TREATING _____ DISPL. _____ OVERALL _____

CEMENT LEFT IN PIPE _____

FEET _____ REASON _____

CUSTOMER

CUSTOMER

ECC SOLUTIONS

LEASE

MATTRESS TROPICAL WELL NO.

JOB TYPE

474

DATE

7-8-96

JOB SUMMARY

HALLIBURTON
DIVISION

HALLIBURTON
LOCATION

SOUTH TEXAS
FROST

BILLED ON
TICKET NO. 883976
WELL DATA

ELD Bay City SEC. _____ TWP. _____ RNG. _____ COUNTY MATAGORDA STATE TEXAS

FORMATION NAME _____ TYPE _____
FORMATION THICKNESS _____ FROM _____ TO _____
TIAL PROD: OIL _____ BPD. WATER _____ BPD. GAS _____ MCFD
ESSENT PROD: OIL _____ BPD. WATER _____ BPD. GAS _____ MCFD
COMPLETION DATE _____ MUD TYPE _____ MUD WT. _____
CKER TYPE E2SV SET AT 3150
TTOM HOLE TEMP. _____ PRESSURE _____
MISC. DATA _____ TOTAL DEPTH _____

	NEW USED	WEIGHT	SIZE	FROM	TO	MAXIMUM PSI ALLOWABLE
CASING		<u>53.5</u>	<u>9 5/8</u>	<u>0</u>	<u>3150</u>	
LINER						
TUBING		<u>13.3</u>	<u>3 1/2</u>	<u>0</u>	<u>3150</u>	
OPEN HOLE						SHOTS/FT.
PERFORATIONS						
PERFORATIONS						
PERFORATIONS						

TOOLS AND ACCESSORIES

TYPE AND SIZE	QTY.	MAKE
FLOAT COLLAR		
LOAT SHOE		
JIDE SHOE		
CENTRALIZERS		
BOTTOM PLUG		
IF PLUG		
OAD		
PACKER <u>E2SV 9 5/8</u>	<u>1</u>	<u>HOOPER</u>
HER		

MATERIALS

TREAT. FLUID _____ DENSITY _____ LB/GAL. API
SPL. FLUID _____ DENSITY _____ LB/GAL. API
ROP. TYPE _____ SIZE _____ LB.
PROP. TYPE _____ SIZE _____ LB.
CID TYPE _____ GAL. %
CID TYPE _____ GAL. %
ACID TYPE _____ GAL. %
SURFACTANT TYPE _____ GAL. IN
E AGENT TYPE _____ GAL. IN
LUID LOSS ADD. TYPE _____ GAL.-LB. IN
GELLING AGENT TYPE _____ GAL.-LB. IN
RIC. RED. AGENT TYPE _____ GAL.-LB. IN
REAKER TYPE _____ GAL.-LB. IN
BLOCKING AGENT TYPE _____ GAL.-LB.
PERFPAC BALLS TYPE _____ QTY.
THER _____
OTHER _____

JOB DATA

CALLER OUT	ON LOCATION	JOB STARTED	JOB COMPLETED
DATE <u>3-1-96</u>	DATE <u>3-1-96</u>	DATE <u>3-8-96</u>	DATE <u>3-8-96</u>
TIME <u>1100</u>	TIME <u>1330</u>	TIME <u>1023</u>	TIME <u>1730</u>

PERSONNEL AND SERVICE UNITS

NAME	UNIT NO. & TYPE	LOCATION
<u>P. JACKSON 44055</u>	<u>41352</u> <u>TOW.</u>	<u>15530</u>

DEPARTMENT 5002
DESCRIPTION OF JOB PTA E2SV

JOB DONE THRU: TUBING ☒ CASING ☐ ANNULUS ☐ TSG./ANN. ☐

CUSTOMER
REPRESENTATIVE X

HALLIBURTON
OPERATOR F.R. JACKSON COPIES
REQUESTED _____

CEMENT DATA

STAGE	NUMBER OF SACKS	TYPE	API CLASS	BRAND	BULK SACKED	ADDITIVES	YIELD CU.FT./SK.	MIXED LBS./GAL.
	<u>260</u>	<u>Pow</u>				<u>None</u>	<u>1.09</u>	<u>16.2</u>

PRESSURES IN PSI
SUMMARY
VOLUMES

CIRCULATING _____ DISPLACEMENT _____ PRESURSH: BBL.-GAL. 5 TYPE E
BREAKDOWN _____ MAXIMUM _____ LOAD & BKDN: BBL.-GAL. _____ PAD: BBL.-GAL. 3
AVERAGE _____ FRACTURE GRADIENT _____ TREATMENT: BBL.-GAL. _____ DISPL: BBL.-GAL. 23.3
SHUT-IN: INSTANT _____ 5-MIN. _____ 15-MIN. _____ CEMENT SLURRY: BBL.-GAL. 50
TOTAL VOLUME: BBL.-GAL. _____

HYDRAULIC HORSEPOWER
REMARKS

ORDERED _____ AVAILABLE _____ USED _____
AVERAGE RATES IN BPM
TREATING _____ DISPL. _____ OVERALL _____
CEMENT LEFT IN PIPE
TEST _____ REASON _____



HALLIBURTON

JOB LOG HAL-2013-C

DATE

3-E-96

PAGE NO.

CUSTOMER
ECO SOLUTIONS

WELL NO.

CELANES DEPOSIT Well

LEASE

JOB TYPE

PTA

TICKET NO.

CHART NO.	TIME	RATE (BPM)	VOLUME (BBL) (GAL)	PUMPS		PRESSURE (PSI)		DESCRIPTION OF OPERATION AND MATERIALS
				T	C	TUBING	CASING	
	1600							called out
	1700							ON LCC / TAYLOR SAFETY MEETING
	1620							RIG UP - WAIT - EST INT
		5						FWAHEAD
	1625	5%	4			250		MIX CNT (a) 15.6
		3						FW BEHIND
		15						BEING
	1650							PULL OUT EZSV
								Rig Down Washup
								Thanks
								Mike S

CUSTOMER



HALLIBURTON

JOB LOG HAL-2013-C

DATE

3-7-96

PAGE NO.

1

CUSTOMER		WELL NO.		LEASE		JOB TYPE		TICKET NO.	
Eco Solutions		2		LUDW		E2SV		883976	
CHART NO.	TIME	RATE (BPM)	VOLUME (BBL) (GAL)	PUMPS		PRESSURE (PSI)		DESCRIPTION OF OPERATION AND MATERIALS	
				T	C	TUBING	CASING		

1330

On Location
Subst Film
Discuss Job w/ W Rep,

1600

Left Location
Return To Location

3-8-96 0600

1023

1100

Start E2SV in hole
Set E2SV 3142'

Start in hole w/ Star Guide

1545

1605

TAG E2SV

Test E2SV

1625

2

40

TA Injection Rate

1630

50

Start Cont 260 SK Pump Cont
mit 16.2 PPL

1700

Displace 3 FW 15000 Bbls
Pull E2SV
SRB's TOP E2SV
P.O.H



HALLIBURTON

HALLIBURTON ENERGY SERVICES

HAL-1906-N

SERVICE LOCATIONS

1. FLOU 1330

2.

3.

4.

REFERRAL LOCATION

INVOICE INSTRUCTIONS

WELL/PROJECT NO.

DELAWARE

TICKET TYPE

NITROGEN

SERVICE

SALES

WELL TYPE

03

LEASE

DELAWARE

CONTRACTOR

THOMSON WILSON

WELL CATEGORY

02

COUNTY/PARISH

MISSISSIPPI

RIG NAME/NO.

100

STATE

TX

SHIPPED

W/

CITY/OFFSHORE LOCATION

Bay City

DELIVERED TO

W.C.

DATE

5-8-96

ORDER NO.

WELL LOCATION

Bay City

WELL PERMIT NO.

CITY

STATE

DATE

ORDER NO.

WELL LOCATION

WELL PERMIT NO.

DATE

ORDER NO.

CITY

STATE

DATE

ORDER NO.

AGE TR

ADDRESS

CITY, STATE, ZIP CODE

ECO SOLUTIONS

CUS

ER

...CKE.

No.

883798 - 3

PAGE 1 OF

PRICE REFERENCE

SECONDARY REFERENCE/ PART NUMBER

ACCOUNTING

LOC ACCT DF

DESCRIPTION

QTY. U/M QTY. U/M

UNIT PRICE

AMOUNT

120 1 M 120 1 M 2 2 342 90

120 1 M 120 1 M 1 1 180 00

350 1 M 350 1 M 1 1 1150 00

120 1 M 120 1 M 1 1 923 75

120 1 M 120 1 M 1 1

120 1 M 120 1 M 1 1

120 1 M 120 1 M 1 1

120 1 M 120 1 M 1 1

120 1 M 120 1 M 1 1

120 1 M 120 1 M 1 1

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LEGAL TERMS: Customer hereby acknowledges and agrees to the terms and conditions on the reverse side hereof which include, but are not limited to, PAYMENT, RELEASE, INDEMNITY, and LIMITED WARRANTY provisions.

MUST BE SIGNED BY CUSTOMER OR CUSTOMER'S AGENT PRIOR TO START OF WORK OR DELIVERY OF GOODS

DATE SIGNED: 5/8/96 TIME SIGNED: 1:00 P.M.

1 ☐ do ☐ do not require IPC (Instrument Protection). ☐ Not offered.

CUSTOMER OR CUSTOMER'S AGENT (PLEASE PRINT) X

CUSTOMER OR CUSTOMER'S AGENT (SIGNATURE) Mike Spahn

EMP # 75071

HALLIBURTON APPROVAL

SUB SURFACE SAFETY VALVE WAS:

☐ PULLED & RETURN ☐ PULLED ☐ RUN

TYPE LOCK

BEAN SIZE

SPACERS

CASING PRESSURE

TUBING PRESSURE

WELL DEPTH

TREE CONNECTION

TYPE VALVE

OUR EQUIPMENT PERFORMED WITHOUT BREAKDOWN?

WE UNDERSTOOD AND MET YOUR NEEDS?

OUR SERVICE WAS PERFORMED WITHOUT DELAY?

WE OPERATED THE EQUIPMENT AND PERFORMED JOB CALCULATIONS SATISFACTORILY?

ARE YOU SATISFIED WITH OUR SERVICE?

☐ YES ☐ NO

CUSTOMER DID NOT WISH TO RESPOND

SURVEY

AGREE

UN-DECIDED

DIS-AGREE

PAGE TOTAL

3125

75

FROM CONTINUATION PAGE(S)

3881

54

SUB-TOTAL

7007

29

APPLICABLE TAXES WILL BE ADDED ON INVOICE

883798 - 3

883798 - 3

883798 - 3

883798 - 3

883798 - 3

883798 - 3

883798 - 3

883798 - 3

883798 - 3

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883798 - 3

883798 - 3

883798 - 3

CHARGE TO

TICKET

ECO SOLUTIONS

No. 883976 - 5

CITY STATE ZIP CODE

PAGE 1 OF 1

HALLIBURTON ENERGY SERVICES

WELL PROJECT NO.

LEASE

COUNTY/PARISH

STATE

CITY/OFFSHORE LOCATION

DATE

OWNER

1. FRESNO 15530

2.

CONTRACTOR

W.D.W.

MATA GORDA

TX

CITY/OFFSHORE LOCATION

DATE

OWNER

2. SERVICE JOB? YES

3.

CONTRACTOR

DAWSON

RIG NAME/NO.

SHIPPED VIA

CITY/OFFSHORE LOCATION

DATE

OWNER

3. SALES

4.

CONTRACTOR

DAWSON

RIG NAME/NO.

SHIPPED VIA

CITY/OFFSHORE LOCATION

DATE

OWNER

WELL TYPE

WELL CATEGORY

JOB PURPOSE

667

CITY/OFFSHORE LOCATION

STATE

CITY/OFFSHORE LOCATION

DATE

OWNER

WELL LOCATION

WELL PERMIT NO.

LAND

CITY/OFFSHORE LOCATION

STATE

CITY/OFFSHORE LOCATION

DATE

OWNER

WELL LOCATION

WELL PERMIT NO.

LAND

CITY/OFFSHORE LOCATION

STATE

CITY/OFFSHORE LOCATION

DATE

OWNER

WELL LOCATION

WELL PERMIT NO.

LAND

CITY/OFFSHORE LOCATION

STATE

CITY/OFFSHORE LOCATION

DATE

OWNER

WELL LOCATION

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STATE

CITY/OFFSHORE LOCATION

DATE

OWNER

LEGAL TERMS: Customer hereby acknowledges and agrees to the terms and conditions on the reverse side hereof which include, but are not limited to: PAYMENT, RELEASE, INDEMNITY, and LIMITED WARRANTY provisions.

DATE SIGNED: 3-8-96 TIME SIGNED: 0700

BY: [Signature] FOR: [Signature]

DATE SIGNED: 3-8-96 TIME SIGNED: 0700

BY: [Signature] FOR: [Signature]

DATE SIGNED: 3-8-96 TIME SIGNED: 0700

BY: [Signature] FOR: [Signature]



HALLIBURTON

HALLIBURTON ENERGY SERVICES

CHARGE TO

ECO SOLUTIONS

ADDRESS

CITY STATE ZIP CODE

No.

883798 - 3

PAGE 1 OF 2

WELL PROJECT NO. FRESNO 15530	LEASE CELANESE DISP WELL	COUNTY/PARISH MATAGORDA	STATE TX	CITY/OFFSHORE LOCATION Bay City	DATE 3-8-96
TICKET TYPE NITROGEN <input type="checkbox"/> YES SALES <input checked="" type="checkbox"/> NO	CONTRACTOR DAWSON WELL SERV	RIG NAME NO.	SHIPPED GV	DELIVERED TO LOC	ORDER NO.
WELL TYPE 03	WELL CATEGORY 02	JOB PURPOSE 100	WELL PERMIT NO.	WELL LOCATION Bay City	

PRICE REFERENCE	SECONDARY REFERENCE/ PART NUMBER	ACCOUNTING LOC ACCT DF	DESCRIPTION	QTY.	U/M	QTY.	U/M	UNIT PRICE	AMOUNT
000-117			20 MILEAGE	120	MI			2.85	342.00
000-119			20	120	MI			1.50	180.00
009-134			20 DEPTH CHG	3550	FT				1680.00
019-000			0 VACUUM TRK (H2O)						923.00

LEGAL TERMS: Customer hereby acknowledges and agrees to the terms and conditions on the reverse side hereof which include, but are not limited to: **PAYMENT, RELEASE, INDEMNITY, and LIMITED WARRANTY PROVISIONS.**

MUST BE SIGNED BY CUSTOMER OR CUSTOMER'S AGENT PRIOR TO START OF WORK OR DELIVERY OF GOODS

X DATE SIGNED 3/8/96 TIME SIGNED 1:00 ☐ A.M. ☐ P.M.

SUB SURFACE SAFETY VALVE WAS: ☐ PULLED & RETURN ☐ PULLED ☐ RUN

SURVEY
 OUR EQUIPMENT PERFORMED WITHOUT BREAKDOWN? ☒
 WE UNDERSTOOD AND MET YOUR NEEDS? ☒
 OUR SERVICE WAS PERFORMED WITHOUT DELAY? ☒
 WE OPERATED THE EQUIPMENT AND PERFORMED JOB CALCULATIONS SATISFACTORILY? ☒
 ARE YOU SATISFIED WITH OUR SERVICE? ☐ YES ☐ NO

PAGE TOTAL 3125 **7**

FROM CONTINUATION PAGE(S) 3981 **5**

SUB-TOTAL 7007 **2**

APPLICABLE TAXES WILL BE ADDED ON INVOICE

CUSTOMER ACCEPTANCE OF MATERIALS AND SERVICES The customer hereby acknowledges receipt of the materials and services listed on this ticket.

HALLIBURTON OPERATOR ENGINEER EMP # 75071 SIGNATURE Mike Supan

HALLIBURTON AGENT SIGNATURE ARM



HALLIBURTON

HALLIBURTON ENERGY SERVICES

HAL-1906-N

SERVICE LOCATIONS

1. Fresno 15530

2.

3.

4.

REFERRAL LOCATION

INVOICE INSTRUCTIONS

11

667

06

DAWSON

WELL CATEGORY

WELL PURPOSE

667

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WELL CATEGORY

WELL PURPOSE

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DAWSON

WELL CATEGORY

WELL PURPOSE

667

06

DUPLICATE COPY

Eco Solutions

ADDRESS

CITY, STATE, ZIP CODE

WELL/PROJECT NO.

2

TICKET TYPE

SALES

NO

WELL TYPE

WELL CATEGORY

WELL PURPOSE

667

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DAWSON

WELL CATEGORY

WELL PURPOSE

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Eco Solutions

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TICKET TYPE

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WELL CATEGORY

WELL PURPOSE

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Eco Solutions

ADDRESS

CITY, STATE, ZIP CODE

WELL/PROJECT NO.

2

TICKET TYPE

SALES

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WELL CATEGORY

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Eco Solutions

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CITY, STATE, ZIP CODE

WELL/PROJECT NO.

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TICKET TYPE

SALES

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WELL CATEGORY

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DAWSON

WELL CATEGORY

WELL PURPOSE



HALLIBURTON

HALLIBURTON ENERGY SERVICES

DATE: 12-26-11

SERVICE LOCATION
1. FRESNO 15330

2.

3.

4.

REFERRAL LOCATION

WELL/PROJECT NO.
WDW 14

TICKET TYPE
☒ SERVICE JOB? ☐ YES ☒ NO

☐ SALES ☒ WELL TYPE

WELL CATEGORY
02

INVOICE INSTRUCTIONS

LEASE
CELANESE Disp well

CONTRACTOR
DAWSON WELL SERV

JOB PURPOSE
115

WELL PERMIT NO.

COUNTY/PARISH
MATAGORDA

RIG NAME/NO.

STATE
TX

SHIPPED TO
VOC

CITY/OFFSHORE LOCATION
Bay City

DELIVERED TO
VOC

DATE
3-11-96

ORDER NO.

WELL LOCATION
Bay City

WELL PERMIT NO.

PAGE
1

OF

OWNER

PRICE REFERENCE	SECONDARY REFERENCE/ PART NUMBER	ACCOUNTING LOC ACCT	DESCRIPTION	QTY.	U/M	QTY.	U/M	UNIT PRICE	AMOUNT
000-117			20 MILEAGE	120	MI			2.85	342.00
000-119			20 CREW MILEAGE	120	MI			1.50	180.00
009-019			20 Depth DAG	3100	FT				1540.00
019-000			0 VACUUM TRK (H2O)						636.00

LEGAL TERMS: Customer hereby acknowledges and agrees to the terms and conditions on the reverse side hereof which include, but are not limited to. **PAYMENT, RELEASE, INDEMNITY, and LIMITED WARRANTY** provisions.

MUST BE SIGNED BY CUSTOMER OR CUSTOMER'S AGENT PRIOR TO START OF WORK OR DELIVERY OF GOODS

DATE SIGNED 12/26/11 TIME SIGNED 4:11 ☐ A.M. ☐ P.M.

☐ YES ☐ NO ☐ CUSTOMER DID NOT WISH TO RESPOND

CUSTOMER ACCEPTANCE OF MATERIALS AND SERVICES The customer hereby acknowledges receipt of the materials and services listed on this ticket.

CUSTOMER OR CUSTOMER'S AGENT (SIGNATURE) Mike Syph EMP # 75071 HALLIBURTON APPROVAL Amal

SURVEY: OUR EQUIPMENT PERFORMED WITHOUT BREAKDOWN? WE UNDERSTOOD AND MET YOUR NEEDS? OUR SERVICE WAS PERFORMED WITHOUT DELAY? WE OPERATED THE EQUIPMENT AND PERFORMED JOB CALCULATIONS SATISFACTORILY? ARE YOU SATISFIED WITH OUR SERVICE?	AGREE <input checked="" type="checkbox"/>	UN-DECIDED <input type="checkbox"/>	DIS-AGREE <input type="checkbox"/>	PAGE TOTAL 2748.2
SUB SURFACE SAFETY VALVE WAS: <input type="checkbox"/> PULLED & RETURN <input type="checkbox"/> DEPTH TYPE LOCK BEAN SIZE TYPE OF EQUALIZING SUB. CASING PRESSURE TUBING SIZE TUBING PRESSURE WELL DEPTH TREE CONNECTION TYPE VALVE				FROM CONTINUATION PAGE(S) 4180.1
SUB-TOTAL APPLICABLE TAXES WILL BE ADDED ON INVOICE				6928.3

**JOB LOG** HAL-2013-C

DATE _____

3-11-96

PAGE NO.

CUSTOMER	WELL NO.	LEASE	JOB TYPE	TICKET NO.
ECO SOLUTIONS	CELANES	DISP WELL	PTA	883799

[illegible]

1100

1500

2100

212

54.3

2

16

CALLED OUT /
 ON LOC / TAIL GATE SAFETY MEETING
 Rig up
~~EDGE~~ AHEAD (MUD FLUSH)
 Mix Card @ 16.2
 FW Behave
 MUD

WASH UP - Through For Day

Thanks
Mike



HALLIBURTON ENERGY SERVICES

FRESNO TEXAS

TICKET CONTINUATION

ORIGINAL

TICKET

No. 883799

HALLIB
FORM 1977 R-10

PRICE

**SECONDARY REFERENCE/
PART NUMBER**

ACCOUNTING		
LOC	ACCT	DE

112

ECO SOLUTIONS

DESCRIPTION

DESCRIPTION	
PREMIUM CEMENT	
(SPLIT BETWEEN POTS TRUCK #53421	

PREMIUM CEMENT

(SPLIT BETWEEN POTS TRUCK #53421

280 | SK

—

QTY.	U/M	QTY.	U/M

07/11/2018

UNIT PRICE

10.90

3052.00

500-207

SERVICE CHARGE

CUBIC FEET

280

1.35

378.00

506-306

MILEAGE CHARGE	TOTAL WEIGHT 26
-------------------	--------------------

60
LOADED MILES

TON MILES

780 60

105	1
-----	---

75013

No. B 289845

CONTINUATION TOTAL

4,180.12



HALLIBURTON

HALLIBURTON ENERGY SERVICES

CHARGE TO:

ECD - SOLUTIONS

ADDRESS

CITY, STATE, ZIP CODE

Original

TICKET

No.

883800 - 5

PAGE 1 OF 1

HAL-1906-N

SERVICE LOCATIONS	WELL/PROJECT NO.	LEASE	COUNTY/PARISH	STATE	CITY/OFFSHORE LOCATION	DATE	OWNER
1. FRESNO KS30	WDWJ 14	CELANESE Disp Well	MATAGORDA	TX	Bay City	3-12-96	
2.		CONTRACTOR	RIG NAME/NO.	SHIPPED	DELIVERED TO	ORDER NO.	
3.		SALES	NO	DAWSON Well Serv	loc		
4.		WELL TYPE	WELL CATEGORY	WELL PERMIT NO.	WELL LOCATION		
		03	02	115	Bay City		
INVOICE INSTRUCTIONS							

PRICE REFERENCE	SECONDARY REFERENCE/ PART NUMBER	ACCOUNTING		DESCRIPTION	QTY.	U/M	QTY.	U/M	UNIT PRICE	AMOUNT
		LOC	ACCT							
000-119				20 MILEAGE (CREW)	120	MI			1.50	180.00
009-019				20 DEPTH CHG	2425	FT				1498.00
019-000				0 VACUUM TEL (H2O)						700.00
				3-13-96						
000-119				20 CREW MILEAGE	120	MI			1.50	180.00
019-000				0 VACUUM TEL (H2O)						891.20
009-019				20 DEPTH CHG	1520	FT				14520.00
018-315				20 MUD FLUSH (3-11)	840	00			65	546.00

LEGAL TERMS: Customer hereby acknowledges and agrees to the terms and conditions on the reverse side hereof which include, but are not limited to, PAYMENT, RELEASE, INDEMNITY, and LIMITED WARRANTY provisions.		SUB SURFACE SAFETY VALVE WAS: <input type="checkbox"/> PULLED & RETURN <input type="checkbox"/> PULLED <input type="checkbox"/> RUN		SURVEY <input type="checkbox"/> OUR EQUIPMENT PERFORMED WITHOUT BREAKDOWN? <input type="checkbox"/> WE UNDERSTOOD AND MET YOUR NEEDS? <input type="checkbox"/> OUR SERVICE WAS PERFORMED WITHOUT DELAY? <input type="checkbox"/> WE OPERATED THE EQUIPMENT AND PERFORMED JOB CALCULATIONS SATISFACTORILY?		UN-DECIDED <input type="checkbox"/> DIS-AGREE		PAGE TOTAL		PAGE TOTAL	
MUST BE SIGNED BY CUSTOMER OR CUSTOMER'S AGENT PRIOR TO START OF WORK OR DELIVERY OF GOODS		TYPE LOCK		DEPTH		SPACERS		CASING PRESSURE		FROM CONTINUATION PAGE(S)	
DATE SIGNED		TUBING SIZE		TUBING PRESSURE		WELL DEPTH		TREE CONNECTION		SUB-TOTAL	
TIME SIGNED		TYPE VALVE		TYPE VALVE		TYPE VALVE		TYPE VALVE		APPLICABLE TAXES WILL BE ADDED ON INVOICE	
DATE SIGNED		TYPE VALVE		TYPE VALVE		TYPE VALVE		TYPE VALVE		21251.9	

CUSTOMER ACCEPTANCE OF MATERIALS AND SERVICES		The customer hereby acknowledges receipt of the materials and services listed on this ticket.		HALLIBURTON APPROVAL	
CUSTOMER OR CUSTOMER'S AGENT SIGNATURE		EMP #		HALLIBURTON APPROVAL	
Mike Spahn		75071		HemMey	

JOB LOG HAL-2013-C

DATE	PAGE NO.
3-12-96	
TICKET NO.	
883800	

CUSTOMER	WELL NO.	LEASE	JOB TYPE
ECO SOLUTIONS	WDW 14	CELANESE Disposal	PTA

CHART NO.	TIME	RATE (BPM)	VOLUME (BBL) (GAL)	PUMPS		PRESSURE (PSI)		DESCRIPTION OF OPERATION AND MATERIALS
				T	C	TUBING	CASING	
	1030							CALLED OUT
	1300							ON LLC / TAIL EATE SAFETY MEETING
								Rig up
	1620	4	10					FIN AHEAD
		1	76					MIX CONT @ 11.2# - 375lbs
			7					7 FW Behind
	1115							SHUT DOWN
								WASH UP - R. THROUGH FIN DRY
3-13	1300							ON LLC / Rig up
	1600	4	5FW					FIN AHEAD
		1	108					MIX CONT @ 11.2
			7FW					7 FW Behind
								COME OUT Laying Down
	1840							ROLL OFF HYDRIL
								# FILL AHEAD w/cont
								Rig Down
								WASH UP
								THANKS
								Mike S



JOB SUMMARY

HALLIBURTON DIVISION SETH 12
HALLIBURTON LOCATION FRESNO

BILLED ON 863800
TICKET NO.

WELL DATA

FIELD BAY CITY SEC. _____ TWP. _____ RING. _____ COUNTY ALTA STATE TX

FORMATION NAME _____ TYPE _____
FORMATION THICKNESS _____ FROM _____ TO _____
INITIAL PROD: OIL _____ BPD. WATER _____ BPD. GAS _____ MCFD
PRESENT PROD: OIL _____ BPD. WATER _____ BPD. GAS _____ MCFD
COMPLETION DATE _____ MUD TYPE _____ MUD WT. 10.2
PACKER TYPE _____ SET AT _____
BOTTOM HOLE TEMP. _____ PRESSURE _____
MISC. DATA _____ TOTAL DEPTH _____

	NEW USED	WEIGHT	SIZE	FROM	TO	MAXIMUM PSI ALLOWABLE
CASING		<u>46</u>	<u>9 7/8</u>	<u>0</u>		
LINER						
TUBING				<u>0</u>	<u>2152</u>	
OPEN HOLE						SHOTS/FT.
PERFORATIONS						
PERFORATIONS						
PERFORATIONS						

JOB DATA

CALLER OUT	ON LOCATION	JOB STARTED	JOB COMPLETED
DATE <u>3-12-81</u>	DATE <u>3-12-81</u>	DATE <u>3-12-81</u>	DATE <u>3-13-81</u>
TIME <u>10:30</u>	TIME <u>17:00</u>	TIME <u>15:00</u>	TIME _____

TYPE AND SIZE	QTY.	MAKE
FLOAT COLLAR		
FLOAT SHOE		
GUIDE SHOE		
CENTRALIZERS		
BOTTOM PLUG		
TOP PLUG		
HEAD		
PACKER		
OTHER		

MATERIALS

TREAT. FLUID _____ DENSITY _____ LB/GAL. ⁰API
DISPL. FLUID _____ DENSITY _____ LB/GAL. ⁰API
PROP. TYPE _____ SIZE _____ LB.
PROP. TYPE _____ SIZE _____ LB.
ACID TYPE _____ GAL. _____ %
ACID TYPE _____ GAL. _____ %
ACID TYPE _____ GAL. _____ %
SURFACTANT TYPE _____ GAL. _____ IN
NE AGENT TYPE _____ GAL. _____ IN
FLUID LOSS ADD. TYPE _____ GAL.-LB. _____ IN
GELLING AGENT TYPE _____ GAL.-LB. _____ IN
FRIC. RED. AGENT TYPE _____ GAL.-LB. _____ IN
BREAKER TYPE _____ GAL.-LB. _____ IN
BLOCKING AGENT TYPE _____ GAL.-LB. _____
PERFPAC BALLS TYPE _____ QTY. _____
OTHER _____
OTHER _____

PERSONNEL AND SERVICE UNITS

NAME	UNIT NO. & TYPE	LOCATION
<u>M. SORAK 76071</u>	<u>9057</u>	<u>1553X</u>
<u>J. McGUIEN 11722</u>	<u>Rem H. 1/2 in.</u>	
<u>C. WILFEE 76077</u>	<u>5121</u>	<u>"</u>
<u>T. O'NEAL 43713</u>	<u>11.8</u>	<u>"</u>
	<u>3006</u>	

DEPARTMENT PMT
DESCRIPTION OF JOB T7A
JOB DONE THRU: TUBING ☒ CASING ☐ ANNULUS ☐ TBG./ANN. ☐
CUSTOMER REPRESENTATIVE X
HALLIBURTON OPERATOR Abbie Sorak COPIES REQUESTED _____

CEMENT DATA

STAGE	NUMBER OF SACKS	CEMENT	BRAND	BULK SACKED	ADDITIVES	YIELD CU.FT./SK.	MIXED LBS./GAL.
	<u>190</u>	<u>Prem</u>		<u>7</u>	<u>1.2% CEL-3</u>	<u>1.09</u>	<u>11.2#</u>

PRESSURES IN PSI

SUMMARY

VOLUMES

CIRCULATING _____ DISPLACEMENT _____ PRESURUSH: BBL.-GAL. _____ TYPE _____
BREAKDOWN _____ MAXIMUM _____ LOAD & BKDN: BBL.-GAL. _____ PAD BBL.-GAL. _____
AVERAGE _____ FRACTURE GRADIENT _____ TREATMENT: BBL.-GAL. _____ DISPL: BBL.-GAL. _____
SHUT-IN: INSTANT _____ 5-MIN _____ 15-MIN _____ CEMENT SLURRY: BBL.-GAL. _____
HYDRAULIC HORSEPOWER _____ TOTAL VOLUME: BBL.-GAL. _____
ORDERED _____ AVAILABLE _____ USED _____ REMARKS _____
AVERAGE RATES IN BPM _____
TREATING _____ DISPL. _____ OVERALL _____
CEMENT LEFT IN PIPE _____
FEET _____ REASON _____

CUSTOMER



HALLIBURTON ENERGY SERVICES

FORM 1977 R-10

FRESNO TEXAS

TICKET CONTINUATION

ORIGINAL

TICKET

No. 883 000

[illegible]

Nº. B 289847

SUB TOTAL

CUSTOMER SIGNATURE _____

DATE 02 MAR-96

ESTIMATED TOTAL	2757.17
-----------------	---------

AWS ENG SIGNATURE

DATE 08-MAR-90

PRICES SUBJECT TO CORRECTION.
TAX NOT INCLUDED.

AWS APPROVAL

**ECO Solutions, Inc.
Hoechst Celanese Chemical
Group, Ltd.
Final Closure Report for WDW-14**

APPENDIX D

**TNRCC PLUG & ABANDON
REGULATIONS**

- (D) the anticipated maximum wellhead and casing seat pressures and flow rates at which the well will operate during cavern development and cavern waste filling;
 - (E) results of the salt cavern injection zone and salt cavern confining zone testing program as required in §331.163(e)(3) of this title (relating to salt cavern solid waste disposal wells).
 - (F) the injection and production procedures for cavern development and cavern waste filling;
 - (G) the compatibility of injected materials with the contents of the salt cavern injection zone and the salt cavern confining zone, and with the materials of well construction;
 - (H) land subsidence monitoring data and groundwater quality monitoring data, including determinations of baseline conditions for such monitoring throughout the area of review;
 - (I) the status of corrective action required for defective wells in the area of review;
 - (J) actual as-built specifications of the well's surface support and monitoring equipment; and
 - (K) conformity of the constructed well system with the plans and specifications of the permit application.
- (3) for Class III wells:
- (A) logging and testing data on the well;
 - (B) a satisfactory demonstration of mechanical integrity for all new wells, excluding monitor wells;
 - (C) anticipated operating data;
 - (D) the results of the formation testing program;
 - (E) the injection procedures; and
 - (F) the status of corrective action required for defective wells in the area of review.

→ §331.46. Closure Standards.

- (a) For Class I wells, other than salt cavern disposal wells, prior to closing the well, the owner or operator shall observe and record the pressure decay for a time specified by the executive director. The executive director shall analyze the pressure decay and the transient pressure observations conducted pursuant to §331.64 of this title (relating to Class I Wells) and determine whether the injection activity has conformed with predicted values.
- (b) For all Class I wells, including salt cavern disposal wells, prior to well closure appropriate mechanical integrity testing shall be conducted to ensure the integrity of that portion of the long string casing and cement that will be left in the ground after closure. Testing methods may include:
 - (1) Pressure tests with liquid or gas;
 - (2) Radioactive tracer surveys for wells other than

- saltcavern disposal wells;
 - (3) Noise logs, temperature logs, pipe evaluation logs, cement bond logs, or oxygen activation logs; and
 - (4) Any other test required by the executive director.
- (c) For Class I wells, other than salt cavern disposal wells, prior to well closure the well shall be flushed with a non-hazardous buffer fluid.
- (d) In closure of all Class I wells, including salt cavern disposal wells, and Class III wells, a well shall be plugged in a manner which will not allow the movement of fluids through the well, out of the injection zone either into or between USDWs or freshwater aquifers or to the land surface. Well plugs shall consist of cement or other materials approved in writing by the executive director, which provide protection equivalent to or greater than that provided by cement.
- (e) The permittee shall notify the executive director before commencing closure according to an approved plan. For Class I wells this notice shall be given at least 60 days before commencement. The executive director will review any revised, updated or additional closure plans.
- (f) Placement of the plugs in the wellbore shall be accomplished by an approved method that may include one of the following:
 - (1) the Balance Plug Method;
 - (2) the Dump Bailer Method;
 - (3) the Two-Plug Method; or
 - (4) an alternate method, approved by the executive director, that will reliably provide a comparable level of protection.
- (g) Prior to closure, the well shall be in a state of static equilibrium with the mud or nonhazardous fluid weight equalized top to bottom, either by circulating the mud or fluid in the well at least once or by a comparable method prescribed by the executive director.
- (h) Each plug used shall be appropriately tagged and tested for seal and stability before closure is completed.
- (i) The closure plan shall, in the case of a Class III production zone which underlies or is in an exempted aquifer, also demonstrate that no movement of contaminants that will cause pollution from the production zone into a USDW or freshwater aquifer will occur. The commission shall prescribe aquifer cleanup and monitoring where deemed necessary and feasible to ensure that no migration of contaminants that will cause pollution from the production zone into a USDW or freshwater aquifer will occur.
- (j) The following shall be considered in determining the adequacy of a plugging and abandonment plan for Class I and III wells:
 - (1) the type and number of plugs to be used;
 - (2) the placement of each plug including the elevation of the top and bottom;
 - (3) the type, grade and quantity of plugging material to be used;

- (4) the method of placement of the plugs;
- (5) the procedure used to plug and abandon the well;
- (6) any newly constructed or discovered wells, or information, including existing well data, within the area of review;
- (7) geologic or economic conditions;
- (8) the amount, size and location by depth of casings and any other materials left in the well;
- (9) the method and location where casing is to be parted if applicable;
- (10) the estimated cost of the plugging procedure; and,
- (11) such other factors that may affect the adequacy of the plan.

→ (k) For Class I wells only, a monument or other permanent marker shall be placed at or attached to the plugged well prior to abandonment. The monument shall state the TWC permit number, date of abandonment, and company name.

→ (l) Each owner of a Class I hazardous waste injection well, and the owner of the surface or subsurface property on or in which a Class I hazardous waste injection well is located, must record, within 60 days after approval by the executive director of the closure operations, a notation on the deed to the facility property or on some other instrument which is normally examined during a title search that will, in perpetuity, provide any potential purchaser of the property the following information:

- (1) the fact that land has been used to manage hazardous waste;
- (2) the name of the state agency or local authority with which the plat was filed, as well as the Austin address of the Underground Injection Control (UIC) staff of the TWC to which it was submitted; and
- (3) the type and volume of waste injected, the injection interval or intervals, and for salt cavern wells, the maximum cavern radius into which it was injected, and the period over which injection occurred.

(m) Within 30 days after completion of closure, the permittee shall file with the executive director a closure report on forms provided by the commission. The report shall be certified as accurate by the owner or operator and by the person who performed the closure operation (if other than the owner or operator). Such report shall consist of a statement that the well was closed in accordance with the closure plan previously submitted and approved by the executive director.

- (n) For salt cavern disposal wells, prior to sealing the cavern and plugging the well, the owner or operator shall complete any pre-closure monitoring of the cavern and its contents required by rule or permit.
- (o) For salt cavern disposal wells, the cavern shall be closed according to Section 331.170 of this title (relating to Cavern Closure).

§331.47. Pond Lining. All holding ponds, emergency overflow ponds, emergency storage ponds, or other impoundments associated with, or part of the surface facilities associated with, underground injection wells shall be lined with clay or an artificial liner as approved by the executive director and as required by permit, and, shall in addition, conform to any applicable requirements of Chapter 335 of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste).

§331.48. Waiver of Requirements. For Class III and Class V Wells Only.

- (a) When injection does not occur into, through or above an underground source of drinking water, the commission by permit may authorize a well with less stringent requirements than those required in this chapter to the extent that the less stringent requirements will not result in an increased likelihood of movement of fluid that may pollute USDWs, and fresh or surface water.
- (b) When injection occurs and a cone of depression centered at the well or well field is maintained for the injection zone, the commission by permit may authorize a well with less stringent requirements for operation, monitoring, and reporting than those required in this chapter to the extent that the less stringent requirements will not result in an increased likelihood of movement of fluid that may pollute USDWs, and fresh or surface water.
- (c) When requirements are reduced under subsection (a) or (b) of this section, a technical summary will be prepared setting forth the basis for the action.

Amendment to: §331.43

Date Adopted: December 7, 1994

Date Filed with the Secretary of State: December 12, 1994

Date Effective: January 2, 1995

Amendment to: §331.44

Date Adopted: December 7, 1994

Date Filed with the Secretary of State: December 12, 1994

Date Effective: January 2, 1995

Amendment to: §331.45

Date Adopted: December 7, 1994

Date Filed with the Secretary of State: December 12, 1994

Date Effective: January 2, 1995

**ECO Solutions, Inc.
Hoechst Celanese Chemical
Group, Ltd.
Final Closure Report for WDW-14**

APPENDIX E

**TRRC PLUGGING RECORD
(FORMS W-3 & W-15)**

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

FILE IN DUPLICATE WITH DISTRICT OFFICE OF DISTRICT IN WHICH WELL IS LOCATED WITHIN THIRTY DAYS AFTER PLUGGING				API NO. (if available) ----		1. RRC District N/A	
2. FIELD NAME (as per RRC Records) N/A		3. Lease Name Class I Injection Well				4. RRC Lease or Id. Number WDW-14	
6. OPERATOR Hoechst Celanese Chemical Group, Ltd.		6a. Original Form W-1 Filed in Name of: N/A				5. Well Number 2	
7. ADDRESS P.O.Box 509, Bay City, TX 77414-0509		6b. Any Subsequent W-1's Filed in Name of: N/A				10. County Matagorda	
8. Location of Well, Relative to Nearest Lease Boundaries of Lease on which this Well is Located		5230 Feet From North Line and 2220 Feet From West Line of the Company property Lease				11. Date Drilling Permit Issued N/A	
9a. SECTION, BLOCK, AND SURVEY James Moore League, abstract 62		9b. Distance and Direction From Nearest Town in this County 10 miles - SW of Bay City, TX				12. Permit Number N/A	
16. Type Well (Oil, Gas, Dry) N/A		Total Depth 3780		17. If Multiple Completion List All Field Names and Oil Lease or Gas ID No.'s N/A		14. Date Drilling Completed ---	
18. If Gas, Amt. of Cond. on Hand at time of Plugging N/A		GAS ID or OIL LEASE # ---		Oil - O Gas - G ---		WELL # ---	
15. Date Well Plugged 3/13/96							

CEMENTING TO PLUG AND ABANDON DATA:				PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7	PLUG #8
*19. Cementing Date				3-8-96							
20. Size of Hole or Pipe in which Plug Placed (inches)				9 5/8							
21. Depth to Bottom of Tubing or Drill Pipe (ft.)				3142							
*22. Sacks of Cement Used (each plug)				260							
*23. Slurry Volume Pumped (cu. ft.)				307							
*24. Calculated Top of Plug (ft.)				3092							
25. Measured Top of Plug (if tagged) (ft.)											
*26. Slurry Wt. #/Gal.				15.6							
*27. Type Cement				H neat							

28. CASING AND TUBING RECORD AFTER PLUGGING					29. Was any Non-Drillable Material (Other than Casing) Left in This Well <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
SIZE	WT. #/FT.	PUT IN WELL (ft.)	LEFT IN WELL (ft.)	HOLE SIZE (in.)	29a. If answer to above is "Yes" state depth to top of "junk" left in hole and briefly describe non-drillable material. (Use Reverse Side of Form if more space is needed.) A cement retainer set at 3140'	
13 3/8	---	1338	1338	17		
95/8	40	3750	3750	12 1/4		
51/2	20	3162	0	---		

30. LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS					
FROM	3354	TO	3414 (4 SPF)	FROM	TO
FROM	3450	TO	3520 (5 SPF)	FROM	TO
FROM	3520	TO	3550 (12 SPF)	FROM	TO
FROM		TO		FROM	TO
FROM		TO		FROM	TO

I have knowledge that the cementing operations, as reflected by the information found on this form, were performed as indicated by such information.
 * Designates items to be completed by Cementing Company. Items not so designated shall be completed by Operator.

Signature of Cementor or Authorized Representative

HALLIBURTON ENERGY SERVICES

Name of Cementing Company

CERTIFICATE:

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

REPRESENTATIVE OF COMPANY

TITLE

DATE

Phone

A/C

NUMBER

SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

Cementer: Fill in shaded areas.
Operator: Fill in other items.

Form W-15
Cementing Report
Rev. 4/1/83
483-045

RAILROAD COMMISSION OF TEXAS
Oil and Gas Division

1. Operator's Name (As shown on Form P-5, Organization Report) Hoechst Celanese Chemical Group, Ltd.	2. RRC Operator No. N/A	3. RRC District No. ----	4. County of Well Site Matagorda
5. Field Name (Wildcat or exactly as shown on RRC records) N/A	6. API No. 42- N/A	7. Drilling Permit No. N/A	
8. Lease Name WDW-14	9. Rule 37 Case No. N/A	10. Oil Lease/Gas ID No. N/A	11. Well No. 2

CASING CEMENTING DATA:		SURFACE CASING	INTER-MEDIATE CASING	PRODUCTION CASING		MULTI-STAGE CEMENTING PROCESS	
				Single String	Multiple Parallel Strings	Tool	Shoe
12. Cementing Date		N/A	N/A	N/A	N/A	N/A	N/A
13. •Drilled hole size							
•Est. % wash or hole enlargement		(SEE OTHER SIDE)					
14. Size of casing (in. O.D.):							
15. Top of liner (ft.)							
16. Setting depth (ft.)							
17. Number of centralizers used							
18. Hrs. waiting on cement before drill-out							
1st Slurry	19. API cement used: No. of sacks ▶						
	Class ▶						
	Additives ▶						
2nd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
3rd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
1st	20. Slurry pumped: Volume (cu. ft.) ▶						
	Height (ft.) ▶						
2nd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
3rd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
Total	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
21. Was cement circulated to ground surface (or bottom of cellar) outside casing?							
22. Remarks ECO SOLUTIONS INC. CELANESE DISPOSAL WELL #2 MATAGORDA COUNTY, TX. TK# 883798							

OVER

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISIONFORM W-3
Rev. 10/78

FILE IN DUPLICATE WITH DISTRICT OFFICE OF DISTRICT IN WHICH WELL IS LOCATED WITHIN THIRTY DAYS AFTER PLUGGING		API NO. (if available) ----	1. RRC District N/A
2. FIELD NAME (as per RRC Records) N/A	3. Lease Name Class I Injection well		4. RRC Lease or Id. Number WDW-14
6. OPERATOR Hoechst Celanese Chemical Group, Ltd.	6a. Original Form W-1 Filed in Name of: N/A		5. Well Number 2
7. ADDRESS P.O.Box 509, Bay City, TX 77414-0509	6b. Any Subsequent W-1's Filed in Name of: N/A		10. County Matagorda
8. Location of Well, Relative to Nearest Lease Boundaries of Lease on which this Well is Located 5230 Feet From North Line and 2220 Feet From West Line of the Company property Lease			11. Date Drilling Permit Issued N/A
9a. SECTION, BLOCK, AND SURVEY James Moore League, abstract 62			12. Permit Number N/A
16. Type Well (Oil, Gas, Dry) N/A	Total Depth 3780	17. If Multiple Completion List All Field Names and Oil Lease or Gas ID No.'s N/A	
18. If Gas, Amt. of Cond. on Hand at time of Plugging N/A		GAS ID or OIL LEASE # ---	Oil - O Gas - G ---
14. Date Drilling Completed ---		15. Date Well Plugged 3/13/96	

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7	PLUG #8
*19. Cementing Date		3-11-96						
20. Size of Hole or Pipe in which Plug Placed (inches)		15"						
21. Depth to Bottom of Tubing or Drill Pipe (ft.)		3100'						
*22. Sacks of Cement Used (each plug)		280						
*23. Slurry Volume Pumped (cu. ft.)		305						
*24. Calculated Top of Plug (ft.)		2478						
25. Measured Top of Plug (if tagged) (ft.)								
*26. Slurry Wt. #/Gal.		16.2						
*27. Type Cement		H neat						

28. CASING AND TUBING RECORD AFTER PLUGGING					29. Was any Non-Drillable Material (Other than Casing) Left in This Well <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
SIZE	WT. #/FT.	PUT IN WELL (ft.)	LEFT IN WELL (ft.)	HOLE SIZE (in.)	29a. If answer to above is "Yes" state depth to top of "junk" left in hole and briefly describe non-drillable material. (Use Reverse Side of Form if more space is needed.) A cement retainer set at 3140'	
13 3/8	---	1338	1338	17		
9 5/8	40	3750	3750	12 1/4		
5 1/2	20	3162	0	---		

30. LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS					
FROM	3354	TO	3414 (4 SPF)	FROM	TO
FROM	3450	TO	3520 (5 SPF)	FROM	TO
FROM	3520	TO	3550 (12 SPF)	FROM	TO
FROM		TO		FROM	TO
FROM		TO		FROM	TO

I have knowledge that the cementing operations, as reflected by the information found on this form, were performed as indicated by such information.

* Designates items to be completed by Cementing Company. Items not so designated shall be completed by Operator.

Signature of Cementer or Authorized Representative

CERTIFICATE:

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

HALLIBURTON ENERGY SERVICES

Name of Cementing Company

REPRESENTATIVE OF COMPANY

TITLE

DATE

Phone

A/C

NUMBER

SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

Cementer: Fill in shaded areas.
Operator: Fill in other items.

RAILROAD COMMISSION OF TEXAS
Oil and Gas Division

1. Operator's Name (As shown on Form P-5, Organization Report) Hoechst Celanese Chemical Group, Ltd.	2. RRC Operator No. N/A	3. RRC District No. -----	4. County of Well Site Matagorda
5. Field Name (Wildcat or exactly as shown on RRC records) N/A	6. API No. 42- N/A		7. Drilling Permit No. N/A
8. Lease Name WDW-14	9. Rule 37 Case No. N/A	10. Oil Lease/Gas ID No. N/A	11. Well No. 2

CASING CEMENTING DATA:		SURFACE CASING	INTER-MEDIATE CASING	PRODUCTION CASING		MULTI-STAGE CEMENTING PROCESS	
				Single String	Multiple Parallel Strings	Tool	Shoe
12. Cementing Date		N/A	N/A	N/A	N/A	N/A	N/A
13. •Drilled hole size							
•Est. % wash or hole enlargement		(SEE OTHER SIDE)					
14. Size of casing (in. O.D.)							
15. Top of liner (ft.)							
16. Setting depth (ft.)							
17. Number of centralizers used							
18. Hrs. waiting on cement before drill-out							
1st Slurry	19. API cement used: No. of sacks ▶						
	Class ▶						
	Additives ▶						
2nd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
3rd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
1st	20. Slurry pumped: Volume (cu. ft.) ▶						
	Height (ft.) ▶						
2nd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
3rd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
Total	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
21. Was cement circulated to ground surface (or bottom of cellar) outside casing?							
22. Remarks ECO SOLUTIONS INC CELANESE DISPOSAL WELL WDW 24 MATAGORDA COUNTY, TX. TK# 883799							

* Designates items to be completed by Cementing Company. Items not so designated shall be completed by Operator.

Name of Cementing Company

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

NUMBER

SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

Cementer: Fill in shaded areas.
Operator: Fill in other items.

RAILROAD COMMISSION OF TEXAS
Oil and Gas Division

1. Operator's Name (As shown on Form P-5, Organization Report) Hoechst Celanese Chemical Group, Ltd.	2. RRC Operator No. N/A	3. RRC District No. -----	4. County of Well Site Matagorda
5. Field Name (Wildcat or exactly as shown on RRC records) N/A		6. API No. 42- N/A	7. Drilling Permit No. N/A
8. Lease Name WDW-14	9. Rule 37 Case No. N/A	10. Oil Lease/Gas ID No. N/A	11. Well No. 2

CASING CEMENTING DATA:		SURFACE CASING	INTER-MEDIATE CASING	PRODUCTION CASING		MULTI-STAGE CEMENTING PROCESS	
				Single String	Multiple Parallel Strings	Tool	Shoe
12. Cementing Date		N/A	N/A	N/A	N/A	N/A	N/A
13. •Drilled hole size							
•Est. % wash or hole enlargement		(SEE OTHER SIDE)					
14. Size of casing (in. O.D.)							
15. Top of liner (ft.)							
16. Setting depth (ft.)							
17. Number of centralizers used							
18. Hrs. waiting on cement before drill-out							
1st Slurry	19. API cement used: No. of sacks ▶						
	Class ▶						
	Additives ▶						
2nd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
3rd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
1st	20. Slurry pumped: Volume (cu. ft.) ▶						
	Height (ft.) ▶						
2nd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
3rd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
Total	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
21. Was cement circulated to ground surface (or bottom of cellar) outside casing?							
22. Remarks ECO SOLUTIONS INC CELANESE DISPOSAL WELL WDW # 14 MATAGORDA COUNTY, TX. TK# 883800							

**ECO Solutions, Inc.
Hoechst Celanese Chemical
Group, Ltd.
Final Closure Report for WDW-14**

APPENDIX F

CORRESPONDENCE

Barry R. McBee, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Dan Pearson, *Executive Director*



TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

January 8, 1996

I. O. Coleman, Jr.
Hoechst Celanese, Chemical Group
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, TX 77404-0509

RE: Approval of Closure Plans, TNRCC Permits No. WDW-14, 32, 49, and 110, Bay City, Texas.

Dear Mr. Coleman, Jr.:

The staff has reviewed your proposed closure plans of the above referenced wells and finds that it meets the requirements outlined in 30 TAC §331.46 (Closure Standards). Please submit the Closure Report as required by §331.46(m) within 30 days of completion of closure. Please also provide evidence of the deed recording as required by §331.46(l) prior to a request of revocation of the permit.

In a meeting with I.O. Coleman, Hoechst-Celanese and Thomas Jones, ECO Solutions on November 14, 1995, it was indicated that WDW-14 had not been operated since the last MIT (2-21-94) and staff agreed that would suffice as final MIT testing prior to closure.

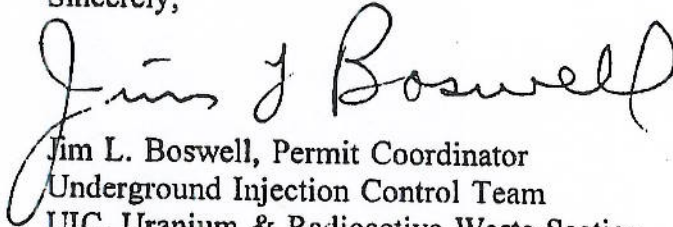
It is also requested that we be kept up-dated on the exact date of closure operations so that a staff member may schedule to be present. If wells WDW-32, 49, or 110 have been in operation since the last MIT or if an extended period of time has elapsed since the last MIT, at the time of closure, a review by staff to ascertain the MIT requirements prior to closing will be necessary.

I. O. Coleman, Jr.

Page 2

If you have any questions, please contact Jim Boswell at 512/239-6196, Mail Code MC-131.

Sincerely,


Jim L. Boswell, Permit Coordinator
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
Industrial & Hazardous Waste Division

JLB/jlb/jm

cc: Brian Graves, EPA Region 6
Tom Jones, Eco Solutions, Inc.

December 5, 1995
IOC - ____ 95

CERTIFIED MAIL

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

Subject: WDW-14, WDW-32, WDW-49 and WDW-110
 PROPOSED CLOSURE PROCEDURES
 HOECHST CELANESE CHEMICAL GROUP, INC.
 BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knape:

Enclosed herewith are the proposed Closure Procedures to plug and abandon WDW-14 (Well No. 2), WDW-32 (Well No. 3), WDW-49 (Well No. 4) and WDW-110 (Well No. 1-A) which are provided for agency review and approval. WDW-14 is scheduled to commence closure during the first quarter, 1996. The closure schedules for WDW-32, WDW-49 and WDW-110 will be submitted to the Texas Natural Resource Conservation Commission as soon as they are finalized.

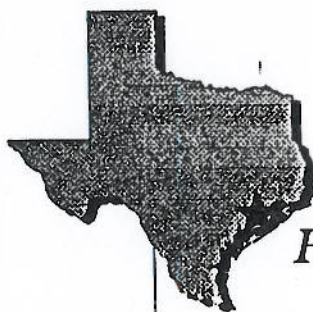
We hope that the presentation at your Austin office on November 14, 1995, will help advance the review process. We would appreciate your consideration, review and approval of the above requests.

Please do not hesitate to contact me at our Bay City Plant at (409)241-4197 or Mr. H. R. Horton at (409)241-4076 if you have any questions concerning this matter.

Very truly yours,

I. O. Coleman, Jr.
Staff Environmental Chemist

IOC/cjs
attachment



*Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Texas*

*Closure Plan For Class I Injection Wells
WDW-14, WDW-32, WDW-49 & WDW-110*

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CLOSURE PLAN

SUMMARY

The following class I injection well closure plan was prepared for Hoechst Celanese Chemical Group's (HCCG's) facility located at Bay City, Texas. The proposed closure plan incorporates procedures to maximize the long term protection of the environment and significantly exceeds the minimum closure standards set by the TNRCC. These procedures include secondary cementing of the protection casing to insure zonal isolation of the injected waste and formation waters from USDWs.

Similar procedures are proposed for wells WDW-14, WDW-32, WDW-49 and WDW-110. Well schematics are included to illustrate the proposed plugging procedures. The schematics indicate section milling above the injection packers and perforating/squeeze cementing at the base of the surface casing(s).

A high compressive strength cement slurry is placed in the annular area in selected intervals *behind* the protection casing. These areas are 1) the area above the injection interval or packer and 2) the area immediately beneath the surface casing.

There are two (2) common techniques of placing cement in these areas:

- a) *Squeeze perforations* - "shoot" holes in the protection casing at specified depths and then force high compressive strength cement through the perforations into the annular space, i.e. "squeeze cementing technique".
- b) *Section milling/underreaming* - physically remove a portion of the protection casing in key sections in the wellbore using a downhole mill. The cement behind the milled section is then underreamed out to the formation face. Finally, a column of high compressive strength cement is placed in the underreamed portion of the wellbore. The net result is a +/-50' continuous "block" of solid, high compressive strength cement is left where the protection casing had been.

The inside of the protection casing is then filled back to the surface with high compressive strength cement. Proper sequencing of this portion of the closure plan depends upon the technique implemented.

Closure on WDW-14 is scheduled to be completed by the end of the first quarter, 1996. The closure schedules of WDW-32, WDW-49 and WDW-110 will be submitted to the TNRCC as soon as they are finalized.



WELL CLOSURE PROCEDURES

SEQUENTIAL PROCEDURES

- 1) Submit closure plan to TNRCC for approval. Meet with the TNRCC if there are any questions or comments.
- 2) Prepare well location for field operations. Line and dike surface area surrounding wellsite- specifically in the area where the workover rig, pumps, tanks and pipe racks will rig up.
- 3) Move in and rig up workover rig and peripheral equipment.
- 4) Rig up slick line unit and go in hole with pressure recording memory tool. Set tool immediately above packer and measure stabilized bottom hole pressure.
- 5) Triple rinse injection string and flush annular area with 9.8 ppg brine.
- 6) Pull out of the hole laying down injection string and TIW seal assembly on pipe racks. HCCG personnel will remove injection string and TIW seal assembly from wellsite.
- 7) Pick up casing scraper and 2+7/8" drill pipe work string. Go in hole with casing scraper to the top of the injection packer. Pull out of the hole with same.
- 8) Move in and rig up wireline unit to set cement retainer. Pick up junk basket and gauge ring and go in the hole to the top of the injection packer. Pull out of the hole with the junk basket and gauge ring. Go in the hole with wireline cast iron cement retainer and set same at approximately 10' above the top of the injection packer. Pull out of the hole and rig down wireline unit.
- 9) Pick-up cement retainer shifting assembly with work string and go in the hole with same. Engage cement retainer with shifting assembly and test annulus to 500 psi to confirm that the cement retainer is properly set.
- 10) Rig up Halliburton, or equivalent service company, to squeeze cement (permanently abandon) the injection zone. Pumping through retainer fill injection interval with high compressive strength cement slurry. Close cement retainer and disengage from same. Leave a 50' column of cement above cement retainer and pull out of the hole with shifting assembly.



- 11) Pick up section mill and drill collars on work string and go in the hole with same. Mill out approximately 50' section above the top of the cement column. Pull out of the hole and remove section mill.
12. Pick up underreamer and drill collars and go in the hole with same. Underream sectioned interval out to approximately 14" diameter borehole. Pull out of the hole with underreamer.
13. Go in the hole open-ended to set cement plug #2. The plug will extend up across the sectioned interval and an additional 300' - 400' above the section. Rig up Halliburton, or equivalent, and set balanced cement plug with high compressive strength cement. Pull out of the hole and wait on cement plug #2 to cure (approximately 12 hours).
14. Go in the hole with 8+3/4" drill bit and drill pipe to confirm the top of the column of cement. "Dress off" top of plug #2 to confirm cement has had sufficient time to properly cure.
15. Rig up Halliburton, or equivalent, and set cement plug #3 with high compressive strength cement. Set balanced cement plug. Cement column to extend from the previous plug up to approximately 200' beneath the base of surface casing. Pull out of the hole and wait on cement plug #3 to cure (approximately 12 hours).
16. Go in the hole with 8+3/4" drill bit and drill pipe to confirm the top of cement column. "Dress off" the top of plug #3 to confirm that cement has had sufficient time to properly cure. Pull out of the hole.
17. Move in and rig up wireline truck to perforate for squeeze job at the base of the surface casing. Perforate the protection casing 2' at 4 shots per foot (8 shots) approximately 10' beneath the surface casing seat. Pull out of the hole and rig down wireline unit.
18. Rig up Halliburton, or equivalent, and set cement plug #4 with high compressive strength cement. Set balanced cement plug. Cement column will extend from the top of plug #3 back to the surface. Pull out of the hole. Apply pressure to cement column to squeeze cement out through the perforations. Wait on cement plug #4 to cure (approximately 12 hours).
19. Go in the hole with 8+3/4" drill bit and drill pipe to confirm the top of cement column. "Dress off" the top of plug #4 to confirm that cement has had sufficient time to properly cure. Fill balance of protection casing with high compressive strength cement as required. Pull out of the hole. Wash out blowout preventors.



20. Rig down and release workover rig. Cut off casings 3' below grade and weld 1/2" steel plate over all casing strings. Inscribe plate with well identification and other pertinent data as required.
21. Prepare summary report for submittal to TNRCC and USEPA Region 6. *Project Complete.*



HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 2
WDW - 14

KB = 11'

Casing out off 3' below grade

FLEXIFLOW Fill Up Collar
Set @ 1338'

13 3/8" 48# H-40 ST&C R-2
Set @ 1369'

Squeeze Perfs
+/- 1380'

50' section drilled
out to 14" from
+/- 60' above retainer

Cement retainer set @ +/-
10' above packer

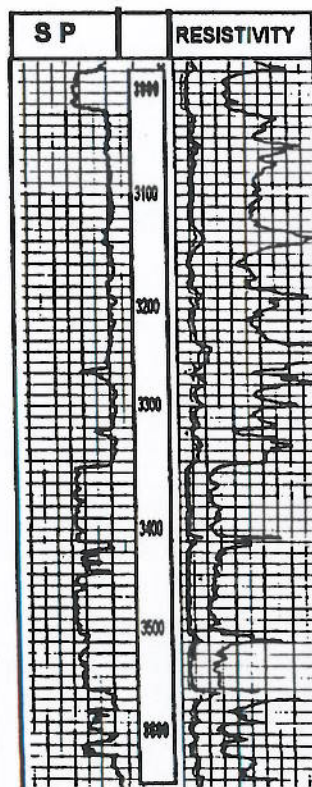
T.I.W. Type JGS 304 S.S. Packer
Set @ 3162'

PERFORATIONS: (TOTAL PERFORATED)
3354' - 3414' 4 SHOTS/FT (3-31-80)
3450' - 3520' 5 SHOTS/FT (1-30-80)
3520' - 3550' 12 SHOTS/FT (12-07-68)
PACKED 20-40 SAND

FLEXIFLOW FILL UP COLLAR
Set @ 3718'

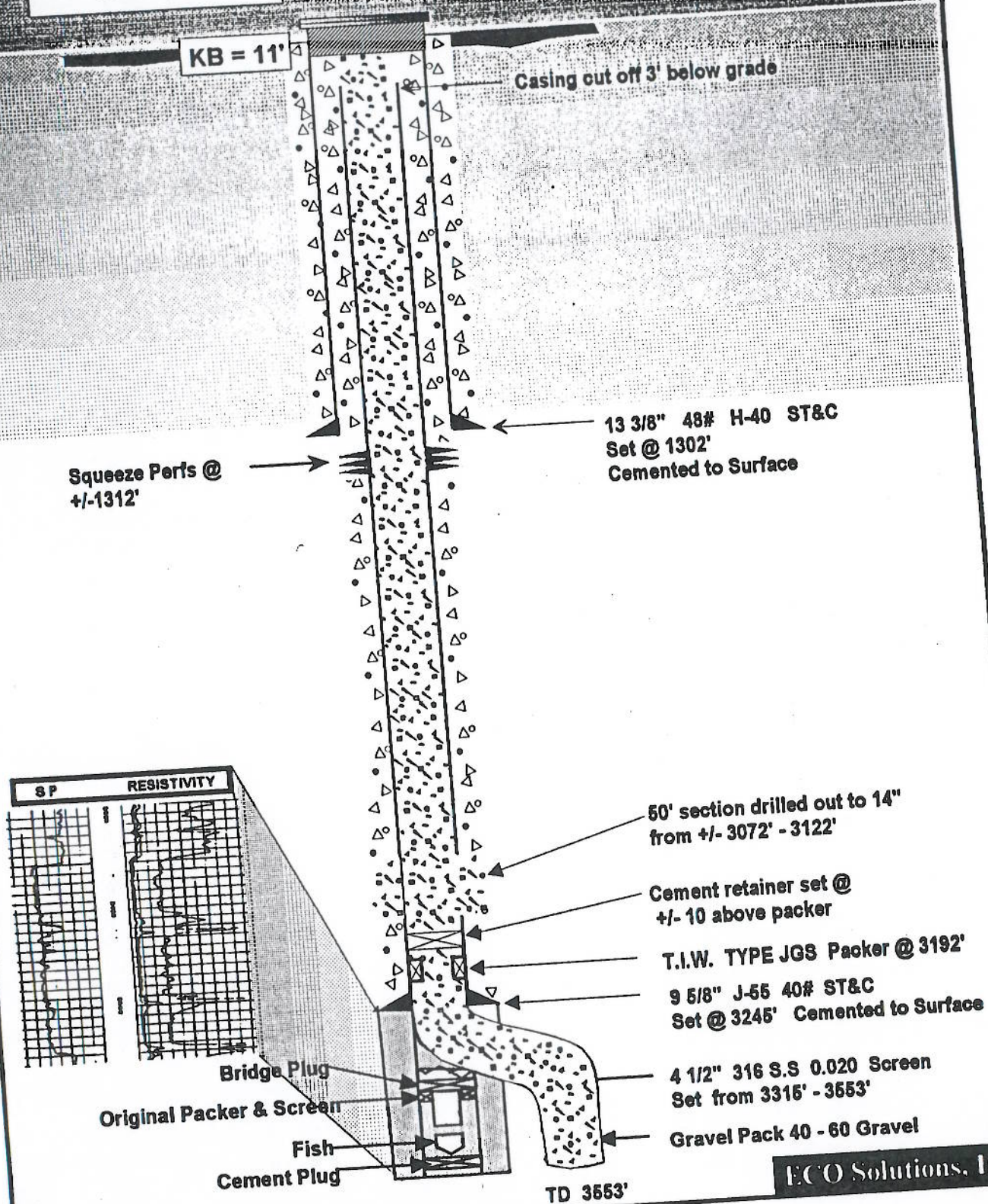
9 5/8" 40# J-55 LT&C R-2
Set @ 3750'

TD 3780'



HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 3
WDW - 32



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HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 4
WDW - 49

KB = 12'

Squeeze Perfs @
+/- 1400'

10 3/4" 32.75" H-40 ST&C
Set @ 1389'
Cemented to Surface

60' section drilled
out to 14" from
+/- 60' above retainer

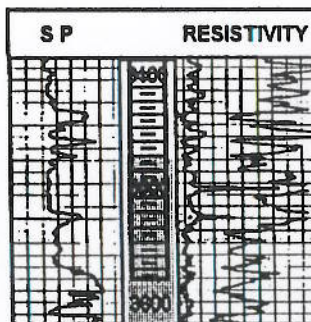
Cement Retainer Set @ +/-3306'
T.I.W. Type S, 316 S.S. Packer
Set @ 3316'

7 5/8" 26.4#, K-55, To 3306' and
3 jts SCH 40 316 SS & FS to 3388'.
Cement circulated to surface.

Gravel Pack, 40-60 Gravel

4 1/2" 316 SS SCH 40 .020 Screen
Set from 3371.5' to 3579'

TD = 3630'



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**Bay City Plant
Disposal Well No. 1-A
WDW - 110**

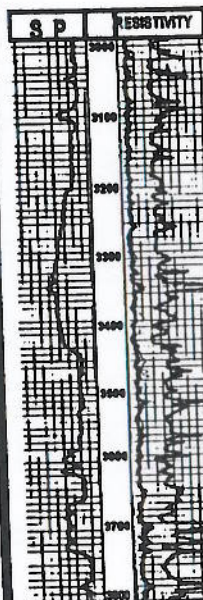
KB = 17'

Casing cut off 3' below grade

Squeeze Perfs
@ +/- 1410'

13 3/8" 54.5# K-55
Set @ 1396'

9 5/8" 40# K-55 & 43# N-80



Cement retainer set @ +/- 10' above packer

5 1/2" x 9 5/8" Pacer set @ 3175'

Plastic Resin Cement from DV tool to 3050' +/-

DV tool @ 3694'

Common Cement from 3800' to 4718'

PBTD 3800'

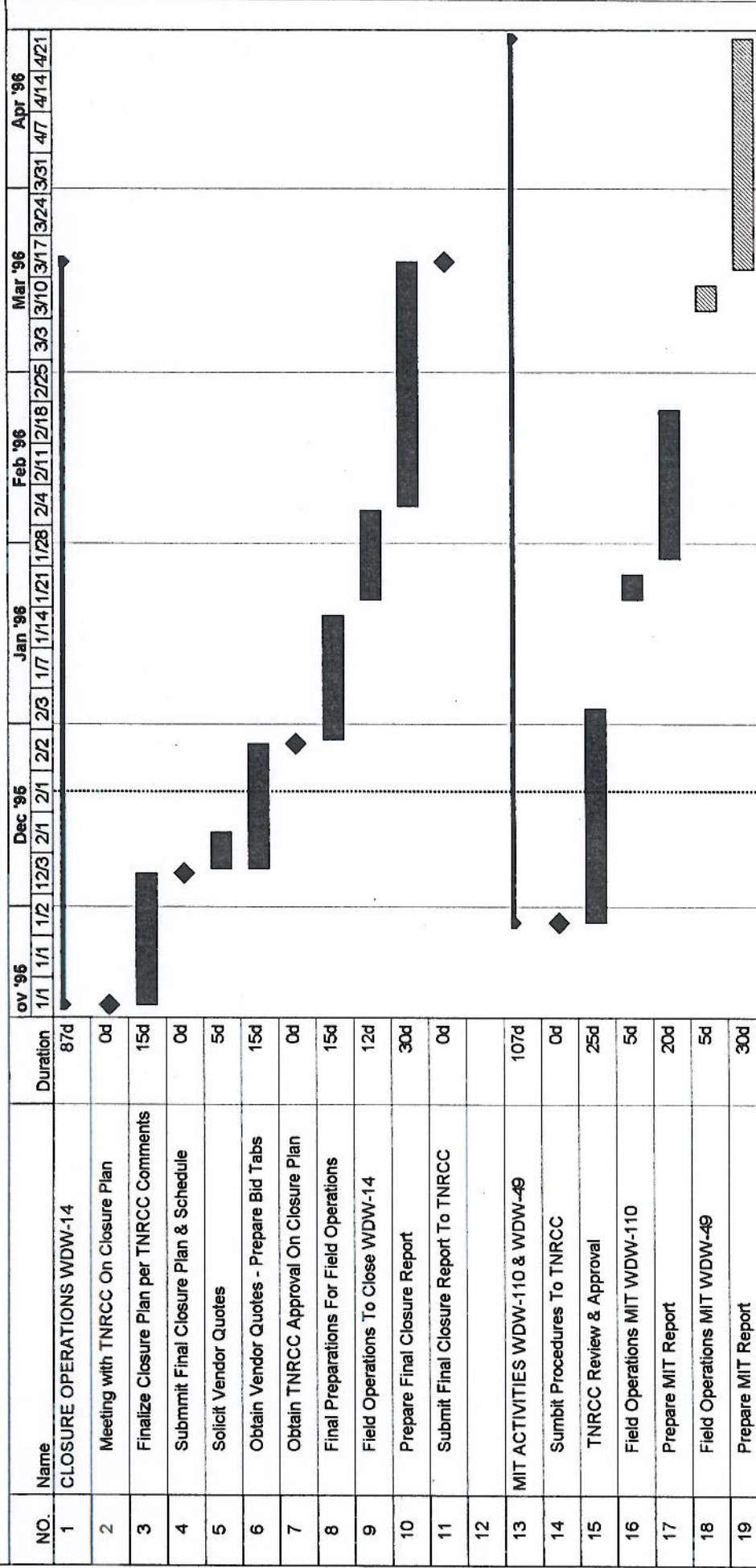
ECO Solutions, Inc.

DESIGNER / DB / PA-110A4 / 10-05-95

HOECHST CELANESE CHEMICAL GROUP - BAY CITY PLANT

SCHEDULE FOR WORK ACTIVITIES ASSOCIATED WITH WDW-14 CLOSURE

AND MECHANICAL INTEGRITY TESTING ON WDW-110 AND WDW-49



ECO SOLUTIONS, INC.

Critical
Noncritical

Normal
Milestone

Summary